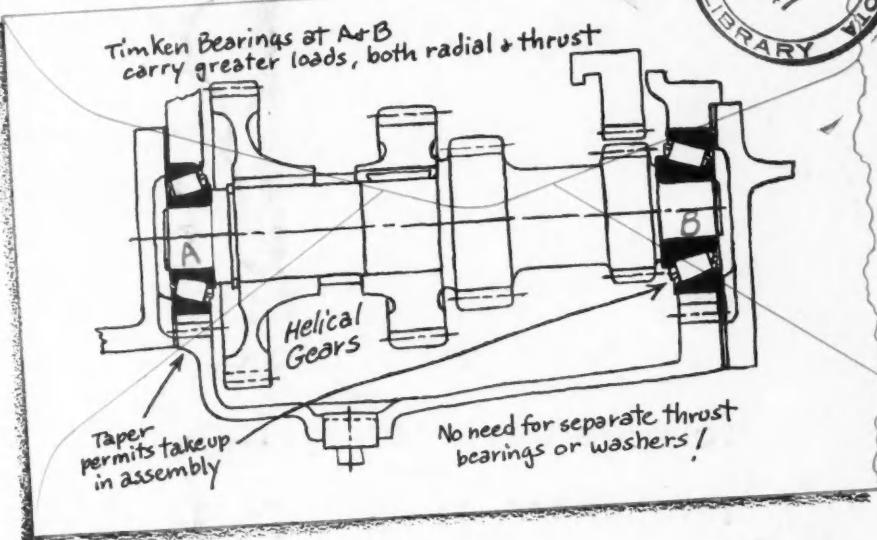


JULY 15, 1947

# AUTOMOTIVE INDUSTRIES

The Industrial News Authority Devoted to Automotive Products for Land, Air & Water

**Idea to simplify  
design of  
automatic  
transmissions**



ally, it's three ideas in one, as the sketch above indicates. First: Because of their tapered roller design Timken bearings carry both radial and thrust loads. No need for special thrust bearings on the countershaft. Second: Because the tapered construction of Timken bearings permits take-up in assembly, thinning tolerances of surrounding parts may be greater. Third: The line contact between the rolls and races gives greater load capacity, permits use of minimum size bearings.

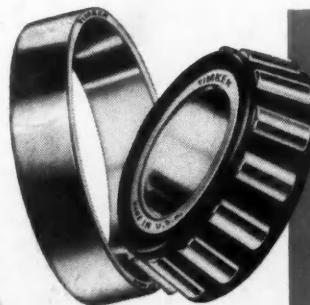
Plus advantages: Timken bearings eliminate deflection and end-movement, hold gears and shafts in rigid alignment, assure smooth meshing, reduce wear on parts.

**LOOK AT REAR WHEELS FOR EXAMPLE...** Here's a typical layout in which the cone is mounted directly on the axle or drive shaft, and the cup mounted in the end of the axle housing.

Timken tapered roller bearings have long-since proved their ability to carry effectively the tough loads in differentials, pin-

ions, transmissions, and front and rear wheels. So when you're designing an automatic transmission, do these two things: First, remember that Timken bearings have been first choice in the automotive industry for nearly 50 years because of precision manufacture, design leadership, quality control and special analysis Timken steels. Second, call upon Timken engineering facilities for help or information in planning the bearing applications in your design. In Detroit the phone number is MADison 1380. The Timken Roller Bearing Company, Canton 6, Ohio.

**NOTE TO P.A.'S** Because every step of the manufacture of Timken bearings is controlled within our company...because our vast manufacturing facilities are widely dispersed...you will find the Timken Company a supply source of outstanding reliability.



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TRADE-MARK REG. U. S. PAT. OFF.  
**TAPERED  
ROLLER BEARINGS**



**I**T takes years for a company to build a reputation for fine engineering, for painstaking workmanship, reliable service and far-sighted vision. • We have adopted this new trade-mark to become a symbol of the reputation which we enjoy today throughout industry.

• We regard this trade-mark as a challenge -- to continue improving on our past achievements, so that we may be of even greater service to our customers in the years ahead.

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Worcester 6, Mass.

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# AUTOMOTIVE INDUSTRIES

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July 15, 1947

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July 15, 1947

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The LeRoi Model 105 "Air master," a two drill compressor, cooled by a Young-engineered radiator with removable cores and mono-weld steel tanks and frame.

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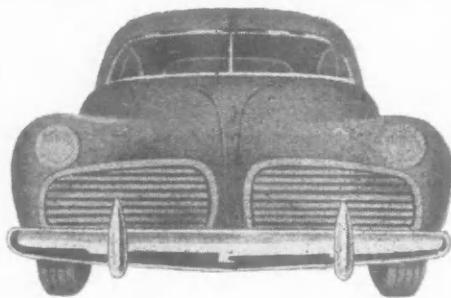
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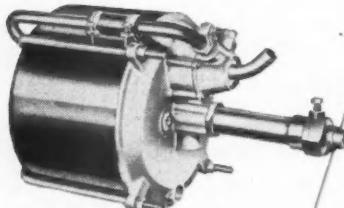
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The dictionary defines engineering as "the science and art of constructing and using machinery." In no other industry has progressive engineering achieved such outstanding results as in the automotive industry. Bendix\* has been the partner of this progress for over thirty years, and has always held a prominent place in the vanguard of new engineering development. Tomorrow, as in the past, the industry can confidently expect the *best* from Bendix—First in Creative Engineering.

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## Some High Spots of this Issue

### **Largest Production Equipment Market in the World**

As the unprecedented demand for motor vehicles continues, manufacturers are committed to heavy spending for equipment. Leonard Westrate has gathered the facts and figures and condensed them for easy reading. In addition, the article discloses the expansion plans of the large automobile makers. See page 24.

### **Federal Adds Five New Models to Its Line of Trucks**

The Federal Motor Truck Co. has rounded out its postwar truck line by bringing out two series comprising five new models that feature faster acceleration and higher sustained top speeds. Specifications and descriptions of these new trucks will be found, beginning on page 27.

### **How Consolidated Vultee Builds the 240 Transport Plane**

Airplanes of a single type which can be taken apart, scrambled up, and then put back together without a single misfit are being produced at Convair's San Diego, Calif., plant. G. F. Gerhauser tells how this is accomplished in an interesting article beginning on page 28.

### **Producing Tailor-Made Cars at Dodge**

Although parts and sub-assemblies are made by mass production methods, the final car is actually a tailor-made product built to the customer's specifications. Scheduling is done from one central dispatching office through teletype transmitters. Joseph Geschelin describes the set-up in an article beginning on page 32.

### **New Light and Medium-Duty Trucks Introduced by GMC**

The FC Series of light and medium-duty trucks brought out by the GMC Truck and Coach Div., General Motors Corp., incorporates many mechanical improvements and in addition provides increased driver comfort together with enhanced eye appeal. These new vehicles are described and illustrated, beginning on page 38.

### **An Experimental Suspension System, 20 Items of New Parts and New Production Equipment, and More High Spots Such As:**

An excellent article showing how exhaust jet cooling will come into still wider use; Ford's Redesigned Facilities for Radiator Production; Bantam Tandem Axle that Features an Intra-Axle Torque Tube; and A New Fuel Nozzle that Utilizes Compressed Air.

### **Comprehensive Interpretation of Industry News, Page 17**

**For Complete Table of Contents See Page 3**



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# RYERSON STEEL

## AUTOMOTIVE INDUSTRIES

# NEWS of the INDUSTRY

### Industry Builds 4 Million Vehicles Since End of War

The automobile industry turned out its four millionth postwar car just two years and four days after the first postwar car was built July 3, 1945, by Ford Motor Co. During the same period 2.2 million trucks and buses have been built, bringing the total output of cars and trucks for the first two postwar years to 6.2 million. Shortage of steel has kept production far below capacity so far this year although output for the first five months reflects an annual rate of 4.6 million cars and trucks.

Production for the second quarter was in the neighborhood of 1.2 million and current predictions for the third quarter indicate that no great upsurge of production is expected. The quarter got off to a poor start with Nash and all Chrysler Div. assembly operations shut down from one to two weeks for lack of steel. The shadow of the coal strike was lifted by agreement reached between the northern operators and the miners' union, but the lag in steel production caused by the miner's vacation is expected to be felt later in July. Current thinking in Detroit still is that it will be the fourth quarter of this year before sheet steel will be in sufficient supply to enable anything like a capacity production. A five million car and truck year still is possible but the chances of obtaining it are considerably slimmer than they were a few weeks ago.

### Automobile Facts and Figures For 1946-47 Now Available

Some idea of the importance of the automotive business in the American economy may be gained from the recently released 1946-1947 Automobile Facts and Figures yearbook, issued by the Automobile Manufacturers' Association. A total of 537,000 automotive businesses, built on production, sales service, and use of motor vehicles, comprise one-sixth of all business concerns in the U. S. Employing 8,200,000 persons, automotive businesses employ one in every seven workers in the country.

The AMA revealed that during the period 1942-46 only an average of

920,000 vehicles were scrapped as contrasted with 2,350,000 vehicles scrapped yearly from 1937 through 1941. Last year, the age of the average vehicle in use was nine years as compared with an average age of five and a half years in 1941.

Motor vehicles produced in the U. S. totaled 3,090,000 in 1946, two-thirds of the total in 1941. The AMA anticipates production of 4,700,000 vehicles this year, including a new record of 1,100,000 trucks, barring strikes.

### Chevrolet Goal in 1947 Is One Million Cars and Trucks

Despite material shortages, General Motors Corp.'s Chevrolet Div. may build one million cars and trucks this year, according to Nicholas Dreystadt, general manager. The total will include 750,000 passenger cars and 250,000 trucks. The one million total would approximate 20 per cent of what the industry is expecting to produce this year and would be about 50 per cent of GM production. Mr. Dreystadt pointed out that the new assembly plant at Flint, which was opened in June, was delayed more than a year by strikes and shortages of materials, and especially a shortage of manpower in the skilled building trades.

### Chrysler Stockholders Approve 2-for-1 Split

The stockholders of Chrysler Corp. have approved the amendment to the Certificate of Incorporation providing for an increase in the number of shares of authorized common stock from six million to 15 million, and decreasing the par value from \$5 to \$2.50 a share. The 4,484,375 shares of \$5 par value stock currently issued will be split two for one, increasing the total to 8,968,750 shares of \$2.50 par value. Under the new split up, 8,702,264 shares will be outstanding, with 266,486 shares held in the treasury of the corporation.

### Cadillac and Ford Advertise Prices

Returning to the prewar practice of advertising new car prices, the Cadillac Div. of General Motors Corp. and Ford dealers in metropolitan Detroit recently advertised new car prices. National Ford price advertising is expected to follow shortly as J. R. Davis, vice president of Ford Motor Co., has announced that dealer committees will be requested to run advertising which shows delivered prices.

\* Advertised in the larger newspapers in the country, the Cadillac

### For Pleasant Farming



Marketed nationally by Dearborn Motors Corp., the new Ford Motor Co. tractor Model 8N, now in production at Highland Park, features an improved hydraulic system permitting operation of tractor and implement as a single unit. An automotive-type steering gear; four forward speeds; and a new drawbar height control mechanism are among the other major improvements.

# NEWS of the INDUSTRY

## 1947 New Passenger Car Registrations\*

Complete returns for March and April  
Arranged by Makes in descending order according to the  
four months' totals

Make	March	April	Four Months	
			Units	% of Total
Chevrolet	50,494	61,569	194,343	19.86
Ford	45,992	43,838	183,963	16.76
Plymouth	28,397	31,610	101,912	10.42
Buick	19,663	21,570	74,361	7.60
Pontiac	17,669	19,551	64,665	6.16
Dodge	16,762	19,402	62,955	6.43
Oldsmobile	15,696	16,402	58,970	6.03
Nash	9,892	11,132	36,490	3.73
Mercury	9,914	9,734	35,676	3.65
Studebaker	9,107	9,658	33,279	3.40
Hudson	9,424	8,720	32,114	3.28
Chrysler	7,779	8,723	29,141	2.98
De Soto	5,660	6,988	22,416	2.29
Cadillac	3,996	4,867	15,852	1.62
Packard	3,859	4,291	14,025	1.43
Kaiser	3,321	3,449	11,912	1.22
Lincoln	2,122	2,242	7,646	.78
Willys	1,738	2,419	6,910	.71
Frazer	1,771	2,450	6,796	.69
Crosley	1,403	1,544	4,652	.48
All Others	55	67	258	.03
Total	264,714	290,226	978,336	100.00

\*Data from R. L. Polk & Co.

advertisement stated that the price for a series of "62" sedan was \$2386 delivered in Detroit "optional equipment, state taxes and accessories extra." The total delivered price for all Ford passenger car models was listed together with the total of federal and state excise taxes in the Ford advertising in Detroit.

### Expect More Curved Glass In 1948 Model Automobiles

A general expectation is that curved glass may become much more general in automotive styling in the next year or two. However, nothing extreme is contemplated, according to automobile designers. They point out that the problem is complicated by the laminated construction of safety glass, since contour of the two outer layers must match exactly. In addition, curved safety glass is much more expensive to manufacture, which is an important consideration. The automobile companies have been working with glass manufacturers for many years on the problem and both admit there are many problems still to be solved.

### Material Shortages Hold Pontiac to 1000 Cars Daily

General Motors Corp.'s Pontiac Div. built about 109,000 cars during the first six months of this year, Harry J. Klingler, general manager, recently told dealers. He pointed out that, while Pontiac production is approximately 1000 units a day, determining factors still are materials shortages, both present and pending.

He said that it will be a major achievement if prices are held at present levels in the face of rising labor and material costs.

### Fisher Models Reflect Young Designers' Ideas

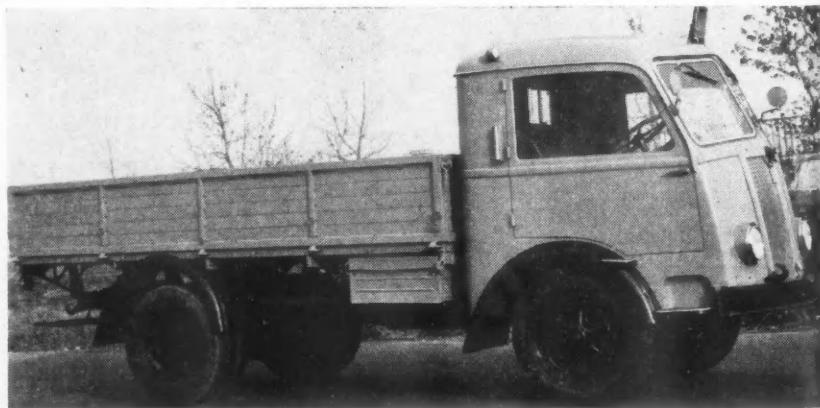
At a recent exhibit of models entered in the Fisher Body Craftsmanship Guild Contest, H. J. Earl, General Motors Corp.'s vice president in charge of styling, commented that trends shown in many of the models embody many popular ideas that cannot be realized because of mechanical limitations. For example, several cars are designed to carry three per-

sons far forward. Mr. Earl pointed out that the design is impractical because of space needed for turning radius of the wheels and accommodating the engine and steering apparatus. A large proportion of the cars are designed for rear engine drive indicating the current trend in that direction in popular thinking. However, Mr. Earl pointed out that the problems of space and weight distribution involved indicate that the engine probably will remain in the front end for some time yet.

### Ford-Chevrolet Sales Battle on Man-to-Man Basis

J. R. Davis, director of sales and advertising for Ford Motor Co., has revealed that the "Beat Chevrolet" offensive is on a man-to-man, dealer-to-dealer basis. He said that each of 6400 Ford dealers has been matched with a Chevrolet dealer of similar size, and that each must be ahead of his competitor in financing, facilities, management, and competitive attitude. The company has maintained advertising budgets at a high level during the war and the immediate postwar period in order to back up the dealer organization, despite the fact that not nearly enough cars were available to meet the demand. For its part, General Motors Corp.'s Chevrolet Div. has an interesting attitude on the Ford campaign and "Beat Chevrolet" slogan. One spokesman for the division says that Chevrolet considers it good advertising since it concentrates attention that Chevrolet has been the sales leader in the low priced field.

### New Fiat Diesel Truck



Representative of Italy's trend towards increasing use of Diesel fuel oil because of the scarcity of gasoline is this new Fiat Diesel truck, model 626 NL. It is powered with a six cylinder in-line engine developing 70 hp at 2200 rpm, that is said to give 13 mpg. Compression ratio is 18 to 1 with a 3.937 in. bore and 4.80 in. stroke. Total weight of the chassis is 6000 lb with a length of 243 in.

# NEWS of the INDUSTRY

## WAA Extends Tucker Agreement

The agreement between the War Assets Administration and the Tucker Corp. for the Dodge-Chrysler Chicago plant has been extended four months past the original date of July 1 in order that Tucker may be able to complete financing arrangements. The Tucker Corp.'s offer to lease the plant with option to buy the land and buildings for \$26 million was originally accepted last year. Provisions of the letter of intent stated that the lease would be for a period of 10 years with a minimum annual rental of \$500,000 for the first two years and \$2.4 million a year thereafter or three per cent of gross sales from factory shipments, whichever is greater.

Prior to issuance of the definitive lease, however, the Tucker Corp. would be required to show financial assets of \$15 million as evidence of productive ability.

## New Packard Convertible To Retail for \$2975

To be displayed publicly in dealer showrooms in large cities across the country, the new Packard Super Eight Convertible's suggested retail price is \$2975, delivered in Detroit, state taxes extra. In making the announcement, George T. Christopher, Packard Motor Car Co.'s president, said that the new car was now in quantity production with an August schedule of 1000.

## New British Car Tax Forecasts New Models

From January 1, 1948, all automobiles registered in Great Britain will pay a flat rate of \$40 per annum. This is the concession made by Finance Minister Dalton which will have the direct effect of causing manufacturers to produce bigger cars suitable for export. Under this system, the small cars of seven, eight and 10 hp, which have been a special feature of the British market, and which were believed to be a protection against American competition, will have to disappear. It is understood that in several cases, plans for new models of this type of car have been scrapped in favor of bigger models, with engines of 122 to 140 cu in.

Cars registered this year under the cubic inches rule will be accepted under the flat rate scheme. All others will continue to pay at the present high rate of taxation. This brings

## New Truck Registrations\*

April and four months 1947 compared with 1946. Arranged by makes in descending order according to the four months' 1947 totals.

Make	April 1947	March 1947	April 1946	Four Months	
				1947	1946
Chevrolet	22,189	22,627	6,404	79,919	13,449
Ford	19,479	17,787	11,244	66,418	39,196
Dodge	12,256	11,220	8,339	41,923	26,308
International	10,958	9,148	4,245	34,668	18,524
G. M. C.	4,964	5,197	954	17,598	2,414
Studebaker	4,013	3,819	1,348	13,318	3,130
Willys	4,021	2,969	3,638	11,903	8,330
Reo	1,323	1,243	858	4,718	2,398
White	1,251	1,123	648	4,268	2,760
Diamond T	952	874	691	3,296	2,171
Mack	1,009	825	546	3,025	2,944
Federal	544	543	315	1,825	1,205
Autocar	467	375	320	1,686	1,287
Brockway	425	315	311	1,634	1,162
Divo	485	362	389	1,496	1,065
Hudson	333	414	241	1,231	552
F. W. D.	86	127	53	461	167
Ward LaFrance	45	51	—	215	—
Sterling	60	52	57	181	192
Oshkosh	18	14	—	85	—
All Others	270	259	319	955	1,041
Total	85,148	79,344	40,920	290,721	128,295

\* Data from R. L. Polk & Co.

about the anomaly of the same type of car paying rates varying as high as 100 per cent, merely because of the date of registration.

Purchase tax on cars selling at more than \$4000 will be doubled. This will hit such makes as Rolls Royce, Bentley, Daimler, Lagonda, several of whom have brought out entirely new models since the end of the war. This measure is being much criticised as likely to have a killing effect on quality car production.

The British automobile industry was in favor of wrapping all taxes up in the selling price of gasoline, and this seemed likely to be adopted when Dalton made his rapid change to the first rate system.

The new type of British car likely to be developed under the flat rate taxation scheme may be expected to have a four cylinder engine of 122 to 130 cu in., a three-speed transmission, and a four to five passenger sedan body. Emphasis will be placed on reduced gas consumption; this, of course, involves total weight reduction. Freed from tax influences, British designers will produce a car having an increasing similarity to popular American makes, but somewhat smaller in size because of garaging difficulties and road congestion.

## K-F May Make Good Showing In Second Quarter Report

Kaiser-Frazer Corp. will report a substantial profit for the second quarter of this year. Estimated sales for June alone were about \$22 million, compared with \$11.7 million for

all of 1946. The profit showing will be the first in the history of the company, which had shown continuing losses over its first year of operation. However, production has been climbing in recent months, with a result that K-F built nearly 50,000 cars during the first half of this year. Production schedules for the last half of 1947 have been set at more than 90,000 cars, barring basic material shortages. The company has completed stocking its network of dealers with service parts to accommodate K-F cars now on the road.

## Studebaker Sole Bidder On Surplus War Plant

Studebaker Corp. has entered the only bid for a surplus aircraft plant that it operated in South Bend during the war. The company bid \$3.29 million for the plant which it is reported to want for manufacture of automobile parts.

## High Cost Delays Use Of Plastic Upholstery

From time to time reports crop out that this or that company is going to use a plastic upholstering material in its new model cars. A check in Detroit has failed to verify the most recent of these reports and most companies predict that conventional textile fabrics will be used for some time yet. They point out that they have been offered a woven nylon material, but that the cost is from 25 to 50 per cent higher than for woolen goods. Chief advantage of plastic materials appears to be their

# NEWS of the INDUSTRY

ease of cleaning since they do not absorb stains as readily as woolen fabrics. Apparently, however, the cost factor still is an important one and will limit the use of plastic materials as upholstery.

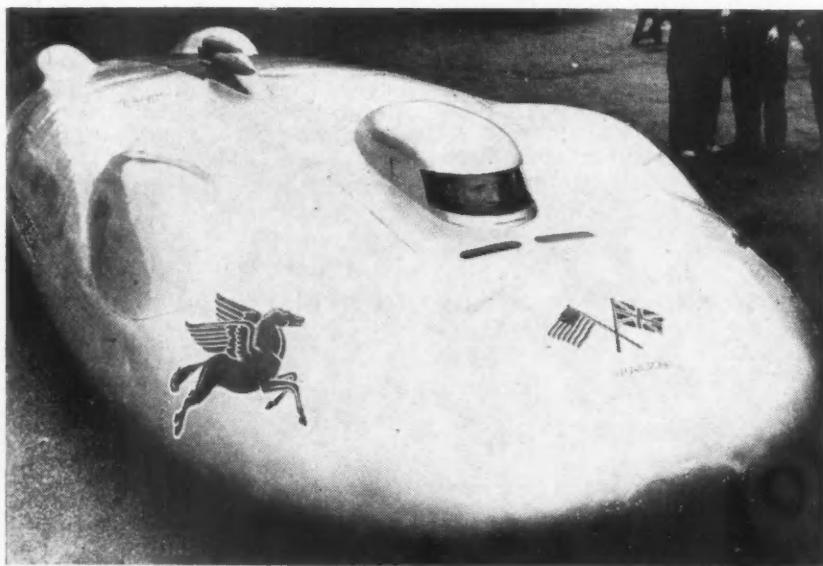
## Cobb to Speed at Utah For World Land Speed Record

In an attempt to break the world land speed record of 369.7 mph, John Cobb expects to speed across Bonneville Flats, Utah, the latter part of this summer. Driving a Railton-Mobil Special, featuring an aluminum alloy body, and powered by two 1250 hp supercharged Napier engines, Mr. Cobb had planned a run originally on the morning of August 15. Inasmuch as the salt beds have not as yet dried out, depending on the weather, the run will now be made the latter part of August or the beginning of September. The course will be approximately 14 mi long and 200 ft wide. Mr. Cobb and his car are expected in the U. S. from England about July 31.

## Industry Interest In Lower Pressure Tire

Along with the trend toward smaller wheels of 15 in. diam., another development reported worth watching is a tire of larger cross section and lower air pressure. Some of the tire companies now are said to be experimenting with such tires.

## May Break World Record



International News photo

**Shooting for a world land speed record of 400 mph, John Cobb expects to drive this Railton-Mobil Special across the Bonneville Flats, Utah, late this summer. The car is powered by two 1250 hp supercharged Napier engines.**

## Motor Vehicle Factory Sales from U. S. Plants\*

	Passenger Cars	Trucks	Buses	1947	1946	Totals
January	247,130	101,092	1,240	349,462	101,867	499,448
February	266,237	106,339	1,211	373,787	93,042	484,891
March	301,810	118,046	1,421	421,277	124,003	510,122
April	314,372	106,760	1,850	422,782	214,350	484,301
May	284,403	96,929	1,853	383,185	243,104	518,746
Total—Five Months	1,413,952	529,166	7,375	1,950,493	776,368	2,477,508

## FACTORY SALES TO DOMESTIC AND FOREIGN MARKETS

	Passenger Cars		Trucks		Buses	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
January	225,989	21,141	77,300	23,792	1,069	171
February	244,411	21,826	83,253	23,086	998	213
March	279,741	22,069	92,006	26,040	1,272	149
April	291,570	22,802	83,308	23,452	1,465	185
May	261,263	23,140	75,671	21,258	1,640	213
Total—Five Months	1,302,974	110,978	411,538	117,628	6,444	931

\* Automobile Manufacturers Association.

## Ford Cuts Scarfing Costs With Oxygen Generators

Installation of the first of four oxygen generating units is well underway at the Ford Motor Co. Rouge plant. The units will be used in the steel mill for scarfing billets and slabs. With the new equipment, Ford will use two torches in place of the one torch used previously and the company says that scarfing operations can be done much faster and more cheaply. Oxygen from the generators also will be available for use with welding and cutting torches and other industrial uses. Under the

arrangement Ford is leasing the equipment and buys the oxygen that is produced. Installation of the first two units is expected to be completed by the end of July and two more will be added during the next year.

## French Tax Cars Again on HP Basis

Hard pressed by financial difficulties, the French Government has broken away from its policy of combining car taxes with the selling price of gasoline, and now is going back to its old system of a horsepower tax. At present this affects only cars more than 12 hp and the high production models of Citroen; Renault and Peugeot will escape. The others will pay \$33 a quarter up to 15 hp, and \$83 a quarter above 15 hp. The French-built Fords will come into these two classes. In addition, the import duty of gasoline has been increased making the average retail price about 66¢ an American gallon. Another old measure which has been revived is the assumption that the possession of an automobile indicates a certain income, forming the basis of an assessment for income tax.

## International Flavor Back In French Car Show

With a total of 900 exhibitors, the French Automobile Salon, to be held October 2-12, will again become a really international event. Almost the entire American industry has applied for booths, with Studebaker the only notable exception. Last year the British kept out of the show, while this year they are all in with the exception of Morris.

# NEWS of the INDUSTRY

## Car Manufacturer To Produce Bumpers

One automobile manufacturer is setting up to make its own bumpers. This company is installing new press equipment and accessory processes and will expand its plating facilities as necessary.

## Nash Assembly In Mexico City

For the first time, Nash cars are being assembled outside the United States. A new Nash assembly plant, Armadora Automotriz, S.A., was opened recently in Mexico City. Mexican owned and operated, the plant is the first to be established in a Nash-Kelvinator Corp. export expansion program which ultimately will include plants in Brazil, Sweden, and Argentina.

## Perhaps Cadillac Engine For Oldsmobile 98 Series

A report in Detroit states that Oldsmobile will use the 150 hp V-8

engine currently used in the Cadillac in its 98 series models next year. It also is said that Cadillac will go to a higher compression 180 hp engine in 1948. Buick is known to be working on a V-8 engine and Oldsmobile and Pontiac also are said to be interested in an engine of this type. The reports seem logical in view of the development by GM Research of the high compression engine, since a shorter engine is much more desirable for high compression operation.

## Ryan Buys Navion Rights

The Ryan Aeronautical Corp. of San Diego recently bought the design and manufacturing rights of the Navion from North American Aviation, Inc. Tooling, engineering, work and spare parts in process for the Navion will be taken over immediately, and, it is expected that production will start this fall. The Navion's present retail price, \$7750 at the factory, will be held, it is anticipated. North American will continue to sell completed Navions until its inventory of 128 planes is sold.

## Plants Telephone Cable



This huge plowshare which was used to drill a five ft slot and lay a telephone cable in a single operation weighs 27 tons. Three 20 ton tractors were used to tow the huge plow, and two of Goodyear Tire & Rubber Co.'s huge tires, size 21.00-28, were mounted directly at the blade, while four Goodyear 14.00-24 tires were used on the front wheels.

## Harry Ferguson Leases Space In Hupp Plant at Detroit

Harry Ferguson, Inc., has announced it will move its operations from the Ford Highland Park plant to the old Hupp plant in Detroit. The company leased office and engineering space there following termination of its contract with Ford Motor Co. June 30 for distribution of Ford tractors. Ferguson recently abandoned plans to manufacture its own tractor at Cleveland and has not announced its plans for the future. However, it is obvious that Ferguson will have no tractor of its own manufacture for several months at the very earliest. The company early in July asked SEC for permission to withdraw a registration statement covering a proposed stock issue because of business and market conditions.

## Ward Estimates Output Drop Because of July 4 Holiday

Ward's Automotive Reports estimated car and truck production in the U. S. and Canada at 66,537 for the week ending July 4th. This compares with a revised estimate of 103,203 units for the preceding week and 45,155 for the comparable week in 1946 and 96,457 for the similar week in 1941.

## Dealers Cut Profit

### \$100 on Kaiser Special

As a result of a voluntary agreement by dealers, the wholesale price of the Kaiser Special has been raised by \$100 by Kaiser-Frazer Corp. with no increase in the retail price of the car. The dealers agreed to shave their profit \$100 a car in exchange for a promise by the company that 50 per cent of K-F production would be the Kaiser Special. Recently two-thirds of production has been in the higher priced Manhattan and Frazer cars with about a third of total production devoted to the Kaiser Special.

## Buick Producing at Half of Projected Postwar Capacity

During the first six months of 1947, Buick Div., General Motors Corp. turned out 125,724 cars or nearly 100,000 more than were built during the first six months of 1946. Production during June was 23,013 vehicles. At the present rate of production Buick would build annually about 50 per cent of the 550,000 yearly capacity it expects to have when all facilities are completed.

# NEWS of the INDUSTRY

## MEWA Will Vote in Dec. On Sponsoring ASI Shows in '48

The Motor & Equipment Wholesalers Association recently announced that, although it will sponsor the Automotive Service Industries Show for 1947, it had decided by unanimous vote that members in executive session at the Convention next December will vote upon the question of whether or not the MEWA will sponsor ASI Shows in 1948 and succeeding years or sponsor a MEWA show under its own auspices.

## Kegresse Transmission Demonstrated on Citroen

The new Kegresse automatic transmission, described in the May 15, 1947 issue of AUTOMOTIVE INDUSTRIES, is being demonstrated on both a Citroen passenger car and a Unic five-ton truck; however, there are no indications that either firm has decided to adopt this device. The transmission is the invention of Adolphe Kegresse. After the death of Kegresse last year, the work was continued by his engineers.

## Standard Tube Co. Constructing New Plant

Standard Tube Co. has started construction of a new plant outside Detroit to cost approximately \$875,000. Plans call for a brick-steel factory with a floor area of 142,000 sq ft. Production of electrical resistance welded steel tubing is expected to be-

## Shipments of Aircraft Engines and Other Products of Aircraft Engine Plants\*

	January	February	March	April
Aircraft Engines For U. S. Military				
Number	334	361	438	430
Value	\$15,736,609	\$12,932,973	\$16,598,837	\$17,257,072
Parts, value	\$1,611,027	\$1,647,106	\$2,248,685	\$2,780,294
For Other Than U. S. Military				
Number	2,528	1,765	2,457	2,472
Value	\$7,109,085	\$5,266,831	\$4,908,589	\$6,192,943
Parts, value	\$2,917,391	\$2,943,682	\$3,105,279	\$3,036,420
All Engines				
Number	2,862	2,126	2,895	2,902
Value	\$22,845,694	\$18,199,804	\$21,507,426	\$23,450,015
Parts, value	\$4,528,418	\$4,590,788	\$5,353,974	\$5,816,704
All Other Products, Value	\$139,160	\$1,098,029	\$459,686	\$455,460
Total Value, Engines and Parts	\$27,513,272	\$23,888,621	\$27,321,056	\$29,722,179

\* Bureau of the Census and Civil Aeronautics Administration.

gin about November 15. The company was founded in 1917 by George B. Storer, present Chairman of the Board of Directors.

## ASTE Show in 1948

The American Society of Tool Engineers will open its next show in Cleveland on March 15, 1948. The ASTE is not sponsoring any other show or exhibition.

## Piasecki Helicopter Moves to Morton, Pa.

The Piasecki Helicopter Corp. recently moved into its new \$500,000 plant in Morton, Pa. Located on a 55 acre plot, the new plant consists of an administration building of 20,000 sq ft, and manufacturing area of about 50,000 sq ft. Piasecki is making the new Navy helicopter.

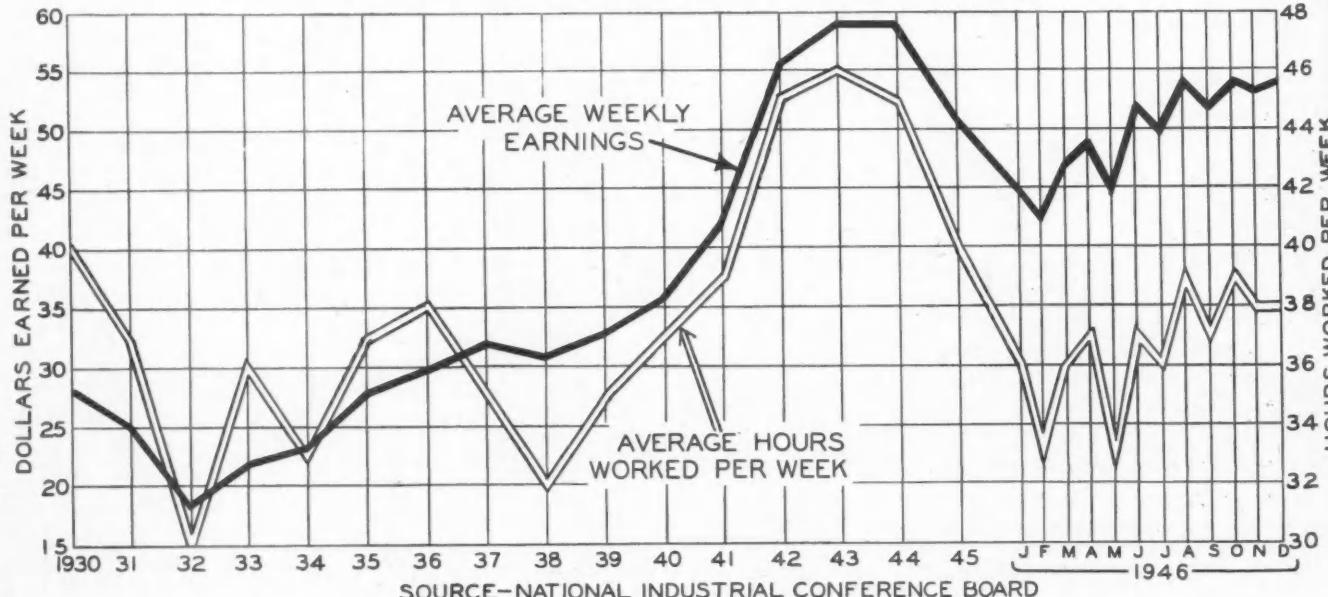
## Grob Bros. Announce Tool Show in Chicago

Grob Bros. of Grafton, Wisc., have announced a Production and Machine Tool Show which is to be held September 17-26 in Chicago. Mr. Richard C. Bonner is the co-manager. This is not to be confused with the Machine Tool Show, sponsored by the National Machine Tool Builders' Association, to be held in the Dodge-Chicago Plant in Chicago, September 17-26.

## Austin Cuts Price \$4; Saves New Buyers \$1000

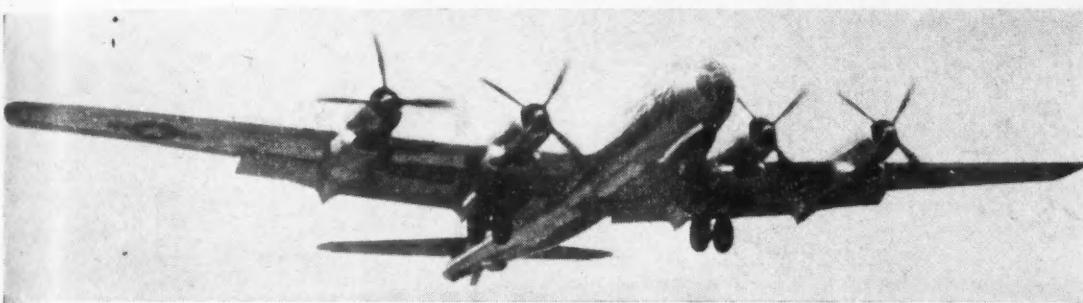
All automobiles priced at £1000 or more are subject to a new British double purchase tax, but by reducing the price of the new Austin Sheerline from £1000 to £999, it now comes under a new flat rate use tax.

## Earnings vs Hours in the Automobile Industry



# NEWS of the INDUSTRY

## Flying Dreadnought



Successfully completing its first test flight recently, this Boeing B-50 is the AAF's newest and fastest bomber. With a reported 5000 mi range and a top speed of 400 mph, it is powered by four 3500 hp Pratt & Whitney Wasp Major engines. International News photo.

## Labor

### Ford's Foremen Strike Ends

Perhaps one of the most significant gains for management in the Taft-Hartley Act is the provision that employers need not recognize foremen's unions. The status of such companies as Packard Motor Car Co. which was ordered by NLRB to bargain with its foremen is an open question at the moment. The company could ask for a court order releasing it from the NLRB obligation in view of the new law, but in such a case FAA may test the constitutionality of the Act. NLRB has been holding in abeyance action against Chrysler, Hudson, and Briggs and it is unlikely that anything further will be done in these cases in view of the provisions of the Taft-Hartley Act. FAA has about 15 contracts at present including Kaiser-Frazer Corp.

Denial of bargaining right protection under the law cut the ground from under the Ford foremen who had been on strike since May 21. There had been a considerable back to work movement and the union was casting about desperately to salvage some kind of contract, but the company stood firm and has refused consistently to negotiate with the foremen's association. Finally, Ford severed its contractual relationship with FAA and the strike collapsed 47 days after it started. There is no doubt that FAA has been greatly weakened by its defeat by Ford but it still is too early to rule the association out of the picture. The union officials say they will contest the Taft-Hartley Act in court and will continue their efforts to gain a contract from Ford within the plant. The executive board also approved a merger with either the CIO or the AFL although there has been no indication from either national union that it is interested in such an affiliation.

### Detroit Tool & Die Workers Get 15-Cent Hourly Pay Raise

The Automotive Tool and Die Manufacturers Association has reached an agreement with the UAW-CIO under which tool and die workers in about 100 shops in Detroit have been granted an increase of 15 cents an hour. The agreement runs from June 1 of this year to the same date next year.

### Ford Grants Pension Plan And Seven-Cent Pay Raise

Full details of the Ford Motor Co. retirement pension plan have not been released by Ford but the UAW-CIO has given considerable publicity to certain provisions of the program. According to the union, agreement with the company provides for the pension plan in addition to a raise of seven cents an hour across the board and an additional five cents increase for more than 10,000 maintenance workers, core makers, and jobbing molders. Although the union states the plan amounts to an increase of more than 20 cents an hour, the company officially has remained silent although one spokesman said unofficially that the raise probably would amount to about 15 cents an hour.

As outlined by the union, major provisions of the retirement plan include the following: Each Ford worker on retirement will receive one per cent of his pay times the number of years service, in addition to Federal Social Security benefits. The plan covers past as well as future service which will require building up a pension fund for workers who have been employed for many years. In the event of death, all employee contributions plus interest will be payable to the employee's beneficiaries. Retirement age will be probably optional between 55 and 65 years of age.

It should be remembered that the

foregoing is the union's interpretation and should be considered in the light of the internal political considerations which form an important part of the UAW-CIO strategy. At the time of the announcement of the retirement plan, Ford spokesmen stated that a great many details still remained to be worked out and until this has been done and the results announced, full details will not be available. The union had stated that cost of the plan at the outset to the company would be \$200 million but this figure is believed to be inaccurate. One responsible company spokesman said that the cost would be much less than that but would not indicate any further details.

## Metals

### Tin

During the next six to eight months any movement from the 80¢ price level will be upward, an analysis of industry factors shows. Department of Commerce figures reveal that it is Government policy to distribute all tin stockpiles held by the Government by the end of the year; by that time, improved Far East tin production will take care of current demand, it is anticipated. An act giving the RFC authority to run the Government-owned tin smelter at Texas City, Tex. until June 30, 1949 has been signed by the President. The advisability of "maintenance on a permanent basis of a domestic tin-smelting industry" will be studied under the provisions of this act.

### Lead

About 550 short tons of lead scrap, received from Japan, will be sold by the U. S. Commercial Co., RFC subsidiary. The lead is to be sold on a sealed bid basis, for delivery f.o.b. Staten Island, N. Y. in five lots of about 110 short tons each.

(Turn to page 94, please)

# World's Largest Production E



THE automotive industry, which, year in and year out, undoubtedly comprises the world's largest market for all kinds of machinery and equipment used in metal working, and for handling, cleaning, fabricating and finishing the multitudinous components that go into the modern automobile, already has spent many millions of dollars for such new equipment since the end of the war. From all indications, it will continue a heavy spending program over the next two or three years.

The day of easy answers about what this or that automotive manufacturer intends to spend for new machinery, equipment and other items, for modernizing or expanding production facilities, or for tooling up for a new model, is over. Early last year many companies talked freely about proposed multi-million dollar expansion and modernization programs, but now the iron curtain is down on that subject. In the main

this stems from a return to the old competitive spirit which holds that the less your rivals know about your business the better.

Shortly after the end of the war, General Motors, for example, reported it had in excess of \$700 million earmarked for a postwar improvement program. Ford announced it was ready to spend \$250 million plus \$50 million for a research center. Packard said it was willing to bet \$20 million on its postwar future. Other companies announced expansion and improvement programs in various amounts in accordance with their size and standing in the industry. Altogether, the various programs totaled about \$1 billion.

A recent *Automotive Industries* survey to determine plans for expenditures for new machinery and equipment during the next year or so, disclosed several avenues of evidence open for exploration which offer some sort of reasonable conclusion about what may be

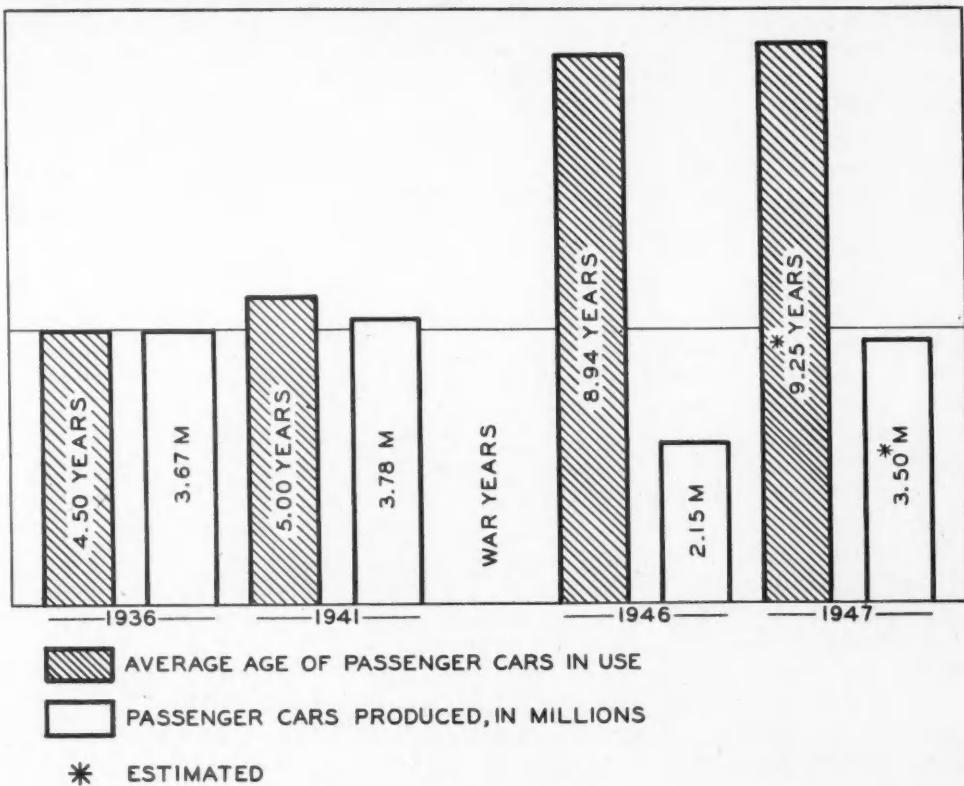
**Automobile Companies Are Committed to Heavy Spending for Equipment and Supplies to Modernize and Expand Plant Facilities as Unprecedented Demand for Motor Vehicles Continues, with Emphasis on Reduction of Production Costs, and with Major Model Changes Closer at Hand.**

# Equipment Market

*By Leonard Westrate*

## How Current Production of Passenger Cars Lags Behind Average Age of Those in Use

(1936 is base year for average age and production bars, respectively)



forthcoming in the way of new machinery and equipment requirements of the various automotive companies.

Just how much of the original \$1 billion dollar war chest, which included all planned expenditures—such as new construction, new equipment, and all other items—has been spent has not been revealed, but whatever the amount may be, much is still to be done to bring the extensive plans to full fruition. It

should be remembered that cost of new facilities has been far above original estimates, causing some companies to enlarge their original allocations. Ford reported recently that new construction is running twice the 1941 rate.

#### **General Motors' Heavy Expenditures**

The purchase of new machinery and equipment will naturally vary among the several companies. That is because introduction of really new models which requires considerable investments in machinery and tooling will not be uniform among the several manufacturers. On the basis of evidence available now, it appears that General Motors will bring out some

new models around the first of the year and that some of its current models may be carried over with style revisions. But the Buick and Cadillac lines and possibly the higher priced models of Oldsmobile and Pontiac will be new models. That should result in considerable new machinery and equipment purchases which accompany a new model introduction.

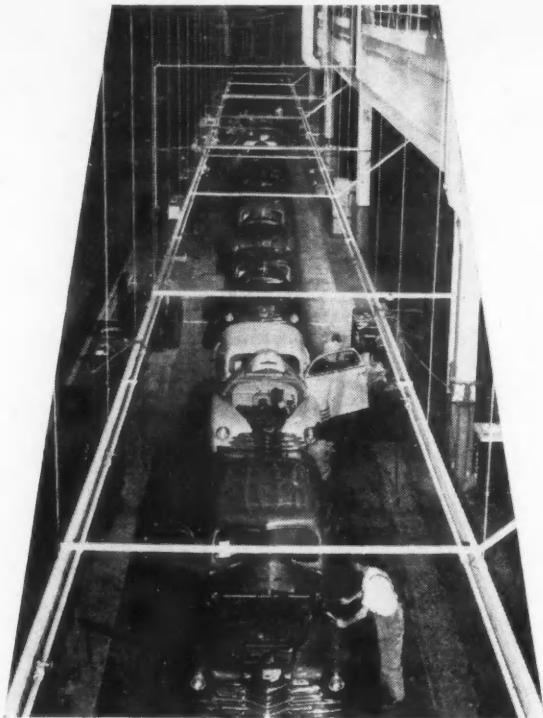
According to the GM annual report, expenditures for special tools during 1946 were \$20,242,191 more than tool amortization for the year, largely because of tooling for the new model program. The report says further that the unamortized balance for special tools at the end of the year was \$56,893,354 as compared with \$36,651,163 at the end of 1945.

It is known that the major new machinery and equipment program at Oldsmobile is yet to come. The division expects to increase productive capacity to 300,000 units annually by adding new machinery and facilities.

So far as Chevrolet is concerned, it appears that the program for the next year will call for the normal replacement only of machinery and equipment. The division is currently completing modernization of existing facilities and the construction of a large assembly plant at Flint has been completed and another at Van Nuys, Cal., will be ready soon. Equipping two such plants is a multi-million-dollar project.

Pontiac Division is completing about a 50 per cent expansion of manufacturing facilities to bring capacity to 500,000 cars a year. The expansion includes engine plant, foundry, axle plant, sheet metal plant, shipping department and new plating installation.

Buick has increased capacity 40 per cent through the addition of 17 new buildings with a total of 2.325 million sq ft of floor space at Flint. New manufacturing facilities which include 2500 new machine tools



will enable the company to exceed its prewar capacity of 1800 cars daily by 40 per cent when ample materials are available.

Cadillac Division has nearly doubled its productive capacity through mechanization of hand operations in modernization of its plants. The division has made heavy expenditures for equipment in its model foundry and plating department.

The GM transmission division currently is undertaking a considerable expansion program to increase output of the Hydra-Matic transmission. A large machinery procurement program is understood to be ready for release and will include machining equipment such as

gear hobbers and shavers and other plant equipment in the materials handling line. It is understood that present plant facilities are entirely inadequate and that a new plant will have to be obtained. There is no indication whether it will be in Detroit, Cleveland, or several other cities which have been mentioned. There have been some reports that the expansion of Hydra-Matic production is due to plans Buick and Pontiac have to include it on 1948 models, but this is not viewed with very much credence in Detroit. A more likely explanation is that it reflects very high public acceptance of Hydra-Matic on Oldsmobile and Cadillac and that, with 90 per cent of these cars going out with the Hydra-Matic, present production facilities will not be adequate to handle the greatly increased car production expected when sheet steel becomes available in ample quantity later this year.

#### **Ford Tooling for New Models**

Ford Motor Co. is currently in the process of tooling for a radically new model Ford for 1948. The Lincoln and Mercury models also are undergoing rather extensive changes for 1948 which will require considerable investment in new machinery and tooling. Total cost of the changeover program has been estimated at between \$50 and \$75 million. Ford has four large assembly plants under construction, with completion expected by 1948.

#### **Chrysler to Spend \$35 Million**

Although Chrysler Corporation declined to comment on its possible tooling cost for 1948 models, a responsible source estimates that the corporation will spend upward of \$35 million for machines and jigs to produce the new models. He added that the cost of tooling

(Turn to page 90, please)

# Federal Adds Five Truck Models

**T**WO series comprising five new truck models have been added to the line of the Federal Motor Truck Co., Detroit, Mich., rounding out its balanced post-war truck series. The 25 Series, consisting of Models 25M and 25M2, has a nominal rating of 2½ to 3½ tons, GVW of 17,500 lb, and GTW of 32,000 lb for truck-trailer combinations. Both models provide, with a minimum of chassis weight, a combination of unusual power and speed unavailable in the line heretofore. In overdrive, the 25M has a theoretical road speed of 60 mph, while the 25M2 has a speed of 67 mph.

The 29ML Series, consisting of Models 29ML, 29ML2 and 29MLA has the same rating as the present 29M Series and is similar to the 29M in many respects. Distinctive feature of the new models is a larger Hercules engine to assure faster acceleration and higher sustained speeds with capacity payloads, thus making them particularly well suited for tractor-trailer operations. Depending upon the combinations of gear ratios and axles, these models have a theoretical road speed from 55 to 64 mph. This series has a nominal rating of 3 to 4 tons, GVW rating of 20,000 lb, and GTW rating of 36,000 lb for truck-trailer combinations. The 155 in. wheelbase chassis shown on the specifications is new in the Federal line.

The 25M Series models are equipped with the Hercules JXC(F) six cylinder gasoline engine modified for Federal to include a Tocco-hardened, seven-bearing counterweighted and balanced crankshaft and special manifolding. In addition these engines are provided

## Specifications of New Federal Truck Models

Model	Wheelbase (in.)	Chassis Weight (lb.)	Cab to End Frame (in.)	CA (in.)
25 M . . . . .	146	4950	107	67
	155	4975	119	76
	167	5000	143	88
	180	5060	167	101
	194	5120	191	115
25 M2 . . . . .	146	5100	...	...
	155	5125	...	...
	167	5150	...	...
	180	5205	...	...
	194	5265	...	...
29 ML . . . . .	146	5535	107	67
	155	5560	119	76
	167	5590	143	88
	180	5655	167	101
	194	5725	191	115
29 ML2 . . . . .	146	5725	...	...
	155	5750	...	...
	167	5780	...	...
	180	5845	...	...
	194	5915	...	...
29 MLA . . . . .	155	5985	...	...
	167	6040	...	...
	180	6105	...	...
	194	6175	...	...

Shortest tractor wheelbase, standard cab 146 in., with sleeper cab 167 in.

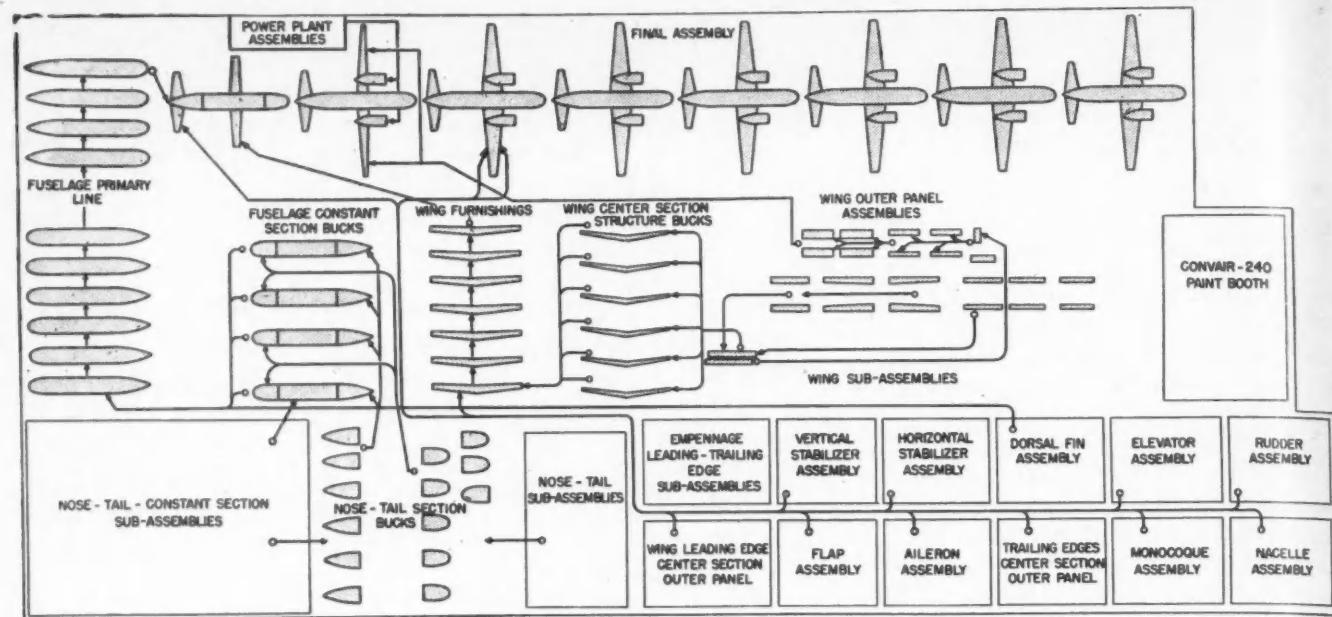
with high-speed high-lift cams and a high-compression cylinder head. Carburetor is a Carter 1½ in. down-draft, equipped with an oilbath air cleaner. An oil filter with replaceable cartridge is standard. Crankcase capacity is 9 qt, the crankcase being fitted with a ventilating system including an oilbath breather. Four-ring pistons are Zollner heavy-duty aluminum alloy. Maximum power of this engine is 102 bhp at 3000 rpm and maximum torque 212 lb-ft at 1400 rpm. A feature of the power plant is the Borg and Beck Model 12E, 12-in. single plate clutch with a lining area of 139 sq in., and torque capacity of 320 lb-ft.

The 29ML Series features the larger Hercules JXLD (F) six cylinder gasoline engine with a seven-bearing, Tocco-hardened, counterweighted and balance crankshaft. It is fitted with aircraft quality high-lead bronze main and connecting rod bearings, combination oil filter and oil cooler, high-torque starting motor, full-floating wrist pins, deep oil pan of nine qt capacity, and

(Turn to page 70, please)



Model 29 Federal truck



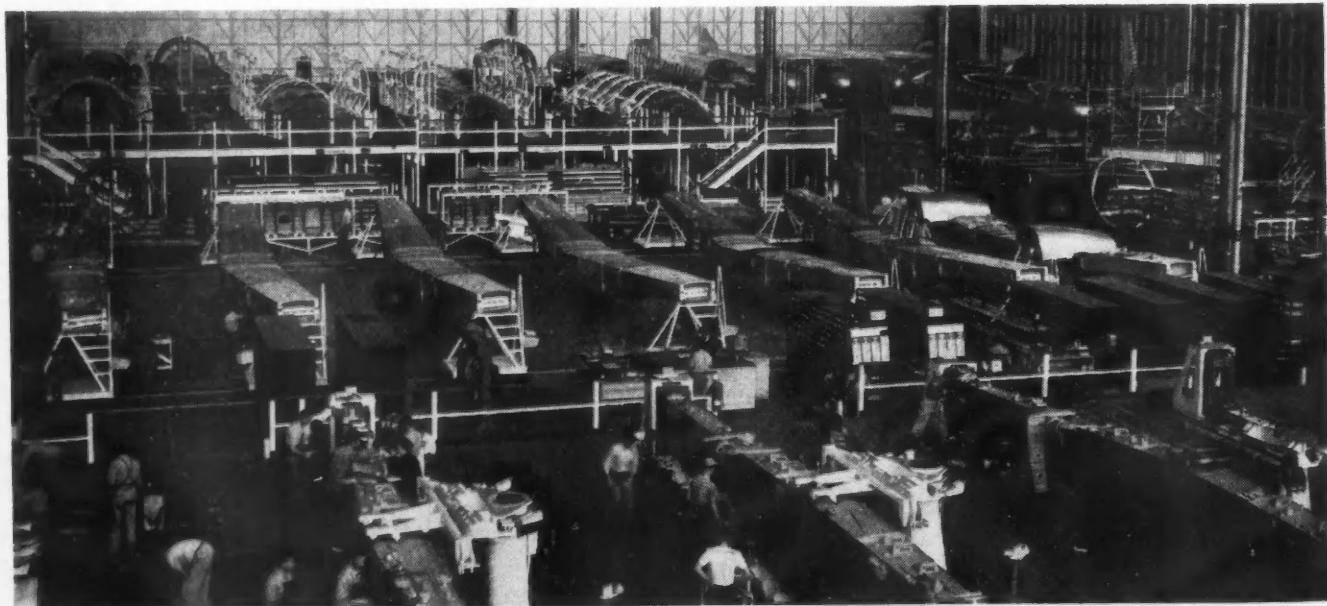
Convair 240 assembly plan for production of one plane per day.

## Convair's Master Plan for

★ ★ ★ ★ ★

By G. F. Gerhauser

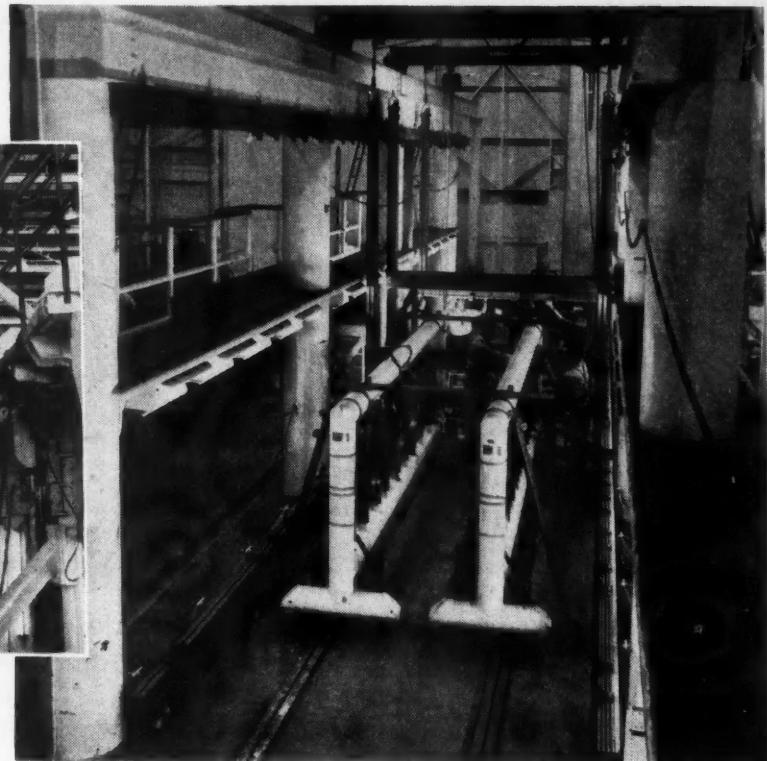
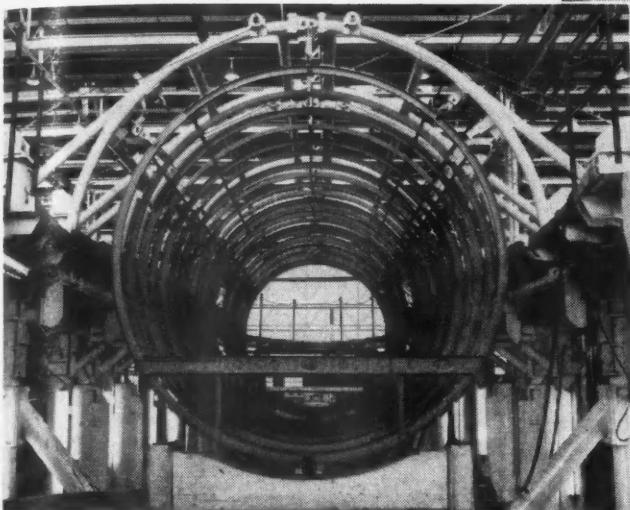
Chief Tool Engineer, San Diego Div.,  
Consolidated Vultee Aircraft Corp.



Several major components of the Convair 240 are visible in this factory view which includes, at the right, a portion of the final assembly line. In the immediate foreground, wing sections are being assembled in vertical bucks before being taken to the wing flat line, at center, where upper nacelles

are installed. To the rear, at the left, are four constant section fixtures in which the nose and tail are mated to the center or constant section of the fuselage. At the rear are fuselages on the primary line, ready to be craned to station 1 on the final line for mating to the wing section.

(Below) View of one of the four fuselage constant section fixtures, looking forward. Bulkheads and beltframes are located accurately by means of tooling holes. The overhead arms are retractable, permitting accessibility during assembly operations.



# Building the 240 Transport

THE objective of Convair-240 tooling was to produce airplanes of a single type which literally can be taken apart, scrambled up, and then put back together without a single misfit. With this basic philosophy as a background, precision-built tools and proven manufacturing practices were used throughout in the construction of the 300 mph, twin-engine transport at Consolidated Vultee Aircraft Corp., San Diego, Calif.

The first step in constructing the Convair 240 was the adoption of a master plan by design and tool engineers who established a manufacturing breakdown of 18 major components for the plane. Of these 18, three are fuselage fixtures, eight involve wing assembly, five are used for tail surface assembly, and two for cowling and nacelle assembly. Master tooling was designed around these major assemblies to form the overall manufacturing pattern. These 18 major components are listed in the next column.

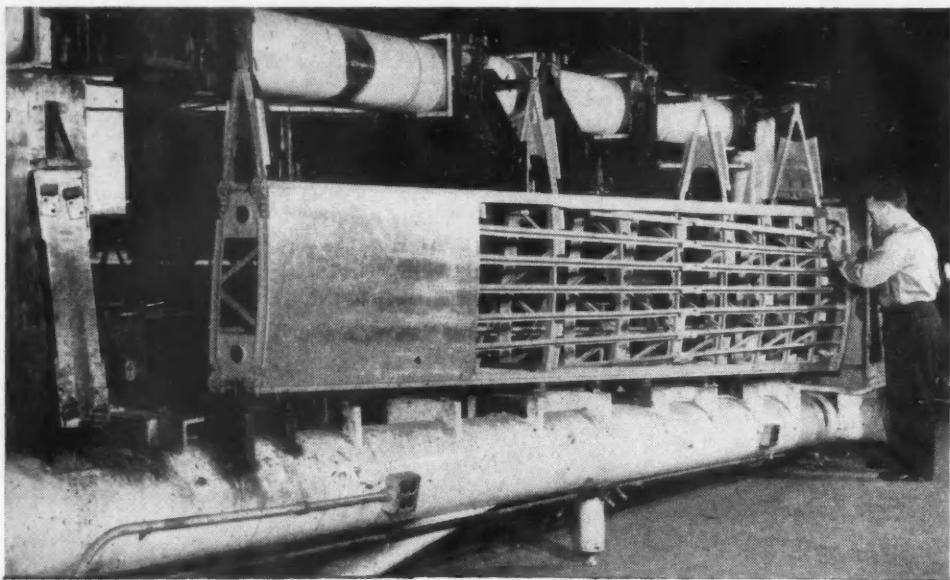
The extent of parts and assembly interchangeability is indicated by the fixtures used in constructing the plane's major components. Many of these fixtures are of considerable size and weight, with heavy wall steel pipe as an integral part of the structures. To accom-

*Master tooling dock for construction of assembly fixtures. This three-dimensional positioning dock assures incorporation of lofiting information into tools to accuracy of 0.002 in., thereby achieving interchangeability of components. This tooling dock system, developed for the production of warplanes and described in the Sept. 1, 1944 issue of Automotive and Aviation Industries, also is being used to build buses.*

## ***Emphasis Placed on Precision Tooling and Proven Manufacturing Methods to Achieve Interchangeability of Parts***

### **Eighteen Major Components**

1. Fuselage constant section	10. Dorsal fin
2. Fuselage nose section	11. Flaps
3. Fuselage tail section	12. Ailerons
4. Wing center section	13. Wing center section leading edges
5. Wing outer panel	14. Wing center section trailing edges
6. Vertical stabilizer	15. Wing outer panel leading edges
7. Horizontal stabilizer	16. Wing outer panel trailing edges
8. Rudder	17. Nacelles—behind firewall
9. Elevators	18. Cowling assembly



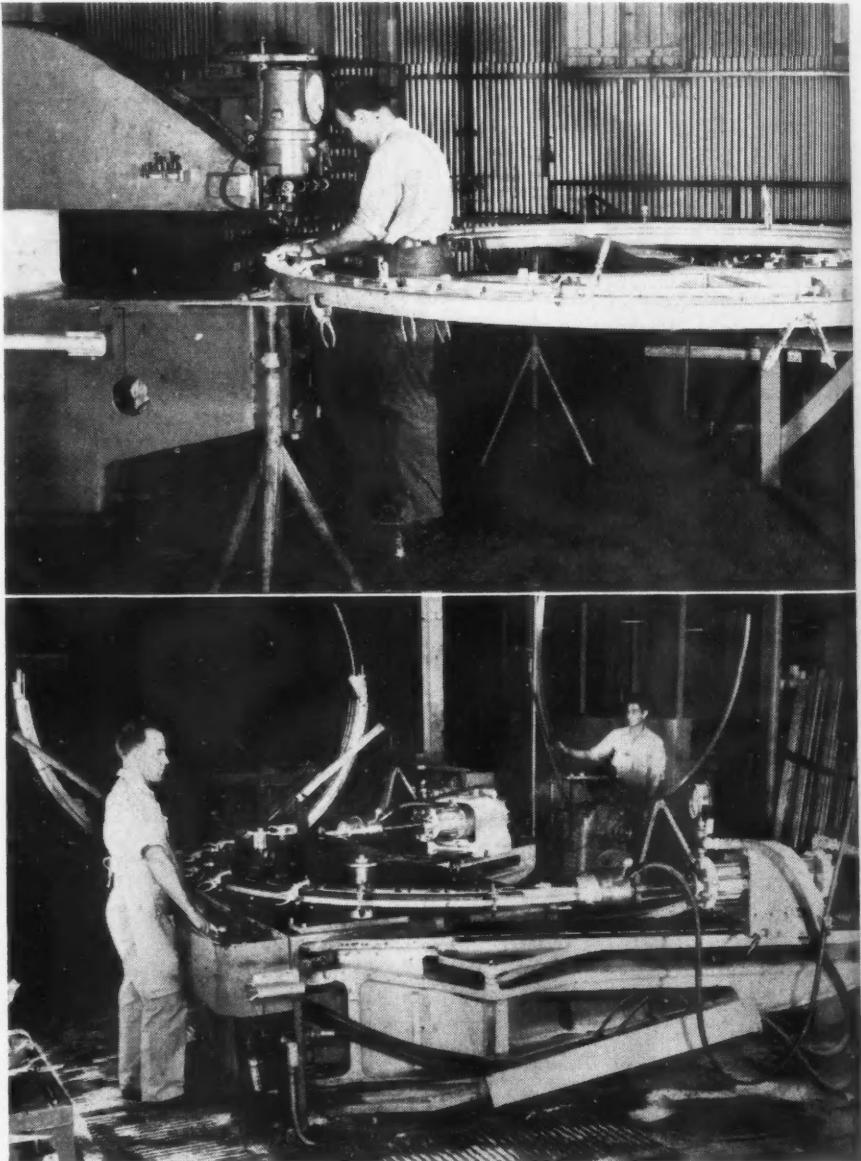
Picture - frame type fixture used in building outer wing panels. It is made of 10 and 14 in. heavy-wall steel members.

(Below) Beltframes for the Convair 240 are made on Erco assembly fixtures fabricated from aluminum alloy sheets on which master layouts have been reproduced by a photographic reflection process. This method produces exact copy, saves considerable time and eliminates virtually all production re-work.

modate the plane's smaller assemblies, smaller fixtures are employed having the same qualities of precision, permanence, and rigidity that are designed into the fixtures for the larger components.

**1. FUSELAGE CONSTANT SECTION**—In general, the fuselage constant section fixture locates the wing-to-fuselage attach forgings, and mates the nose and tail sections to the constant section. It is massively constructed with a 20-in. diameter pipe backbone for the base, 12-in. diameter ribs, ten-in. diameter side members, eight-in. diameter verticals, and three-in. diameter overarms. The constant section fixture and the nose and tail bucks are self-supporting and can be moved from one place to another without affecting any of the locators. In mating the nose section to the constant section, the nose is positioned from nose landing gear fittings by a locator which duplicates that in the nose buck. A cradle for vertical and horizontal adjustment is located at the position at which the nose and constant section join. The tail section, which also has an adjustable cradle, is located in the constant section fixture by plates attached to horizontal stabilizer fittings.

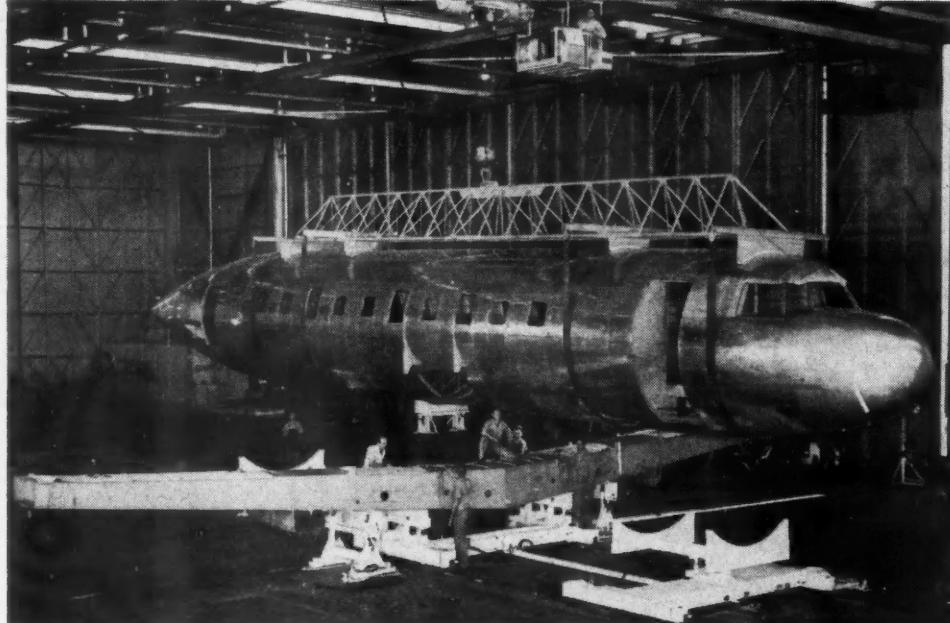
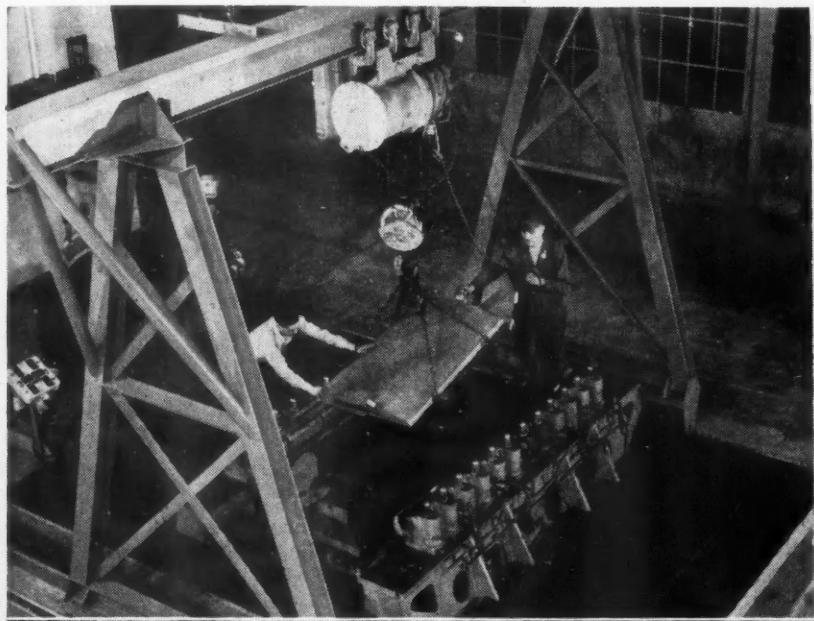
In the center of the constant section fixture is a rectangular frame with four bushed holes from which wing attach fittings



Forming the beltframe is accomplished with a forming machine which, by means of air pistons of various capacities, pulls the metal over forms to shape it to close tolerances.

are located. To insure interchangeability, this frame is coordinated with the wing buck locators by a master gage. Locators in this fixture also position the two main stringers above and below the windows and the escape hatch longerons. Locators along the 20-in. diameter pipe position the two main longerons, in addition to cradling the ship following application of the lower panels.

**2. FUSELAGE NOSE SECTION FIXTURE**—The fuselage nose section fixture is used to assemble the pilot's cabin floor and nose wheel shear beams sub-assembly (which contains nose wheel landing gear attachments), the pilot's enclosure, bulkheads, beltframes, longerons, skin-stringer panels, and the nose cap. Fuselage beltframes and skin-stringer panels are generally assembled and riveted on automatic Ercō indexing fixtures. These fixtures are fabricated by trimming, drilling, slotting, and stiffening aluminum alloy sheets on which engineering master layouts have been reproduced by the photographic reflection process.



Basically, the fuselage nose buck is constructed with a self-supporting base having a 20-in. diameter pipe for a backbone, ten-in. diameter pipe for ribs and side members, and eight-in. diameter pipe for uprights. Overarms, counterweighted in such a manner that one man can operate them, are built of three-in. diameter pipe rolled into a radius and split on the center line of the fixture. When the two halves of the overarms join, a taper pin is inserted to insure their relationship. Each half of the overarm carries bulkhead or beltframe locators. Each bulkhead or beltframe is positioned by four locators, three contour locators and the one at the top vertical center line for locating the bulkhead or beltframe by a tooling hole.

The landing gear is located by four retractable pins that control the fitting locations station-wise, half breadth, and water-line dimensions. These pins remain until the nose is ready to be taken from the buck. The buck is equipped with retractable locators for the sills, the longerons and the nose cap, and for cradling the nose after lower skin segments have been installed. After the ship has been cradled, the overarms are opened and remaining skin segments applied. Each skin panel has its individual skin-stringer assembly fixture except the lap stringer, which is installed as a loose piece in the buck to provide correct spacing of bulkheads and beltframes. A dummy passenger door is positioned to insure interchangeability of hinge points and latches and to make certain the door opening is correct in size for subsequent weather sealing.

**3. FUSELAGE TAIL SECTION FIXTURE**—The fuselage tail section fixture is similar in appearance to the nose buck except for the base, locates and assembles bulkheads, beltframes,

(Turn to page 60, please)

*(Top) Shown here is a 10-ton capacity air hoist lowering a stretch form to a stretch press. Air cylinders are located along each side of the press for holding the metal in place as the high pressure is applied.*

*In this photo, the fuselage is being lowered to the wing section. An assembly worker is stationed at each of the four attachment points. The wing section is positioned by means of hydraulic jacks located outboard of the carriage.*

# Tailor-Made Cars

## by Teletype

**Production Scheduling at Dodge Plant of Regular Equipment and Various Combinations of Body Types, Colors, Accessories and Other Options Handled Through Two Main Transmitters Directly Connected to 17 Key Stations.**

By Joseph Geschelin

CHRYSLER CORPORATION		
DODGE MAIN DIVISION		
SPECIAL INSTRUCTIONS		
TRACER ROUTING	SCHEDULE	DATE
EXCEPTIONS	REISSUED	ROUTE
AXLE	RATIO	LOW COMPRESSION HEAD
ROUTINE	EXHAUST SYSTEM	SPECIAL UNIVERSAL JOINT
BOXING	FUEL PUMP	EXHAUST SYSTEM
KILO SPEEDOMETER	SPECIAL BATTERY	EXPORT TOOL KIT
LOCKING GAS CAP	LOCKING GAS CAP	SPECIAL HEADLAMPS
TUBES	TUBES	SPECIAL RADIATOR CORE
TIRES	SPECIAL TIRES	SPECIAL SPRINGS
WHEEL-RINGS-DISCS	STONE SHIELDS	SPECIAL SHOCK ABSORBER
STONE SHIELDS	FRONT-REAR GUARDS	BOXING
FRONT-REAR GUARDS	BUMPER EQUIPMENT	KILO SPEEDOMETER
BUMPER EQUIPMENT	SPECIAL OIL FILTER	LOCKING GAS CAP
HEAVY DUTY AIR CLEANER	HEAVY DUTY AIR CLEANER	TUBES
CIGAR LIGHTER	CIGAR LIGHTER	TIRES
GLOVE BOX LOCK	GLOVE BOX LOCK	WHEEL-RINGS-DISCS
GLOVE BOX CLOCK	GLOVE BOX CLOCK	STONE SHIELDS
DIRECTIONAL LAMPS	DIRECTIONAL LAMPS	FRONT-REAR GUARDS
RADIO	RADIO	BUMPER EQUIPMENT
HEATER	HEATER	SPECIAL OIL FILTER
FLUID DRIVE	FLUID DRIVE	HEAVY DUTY AIR CLEANER
ACCESSORY GROUP	48	48

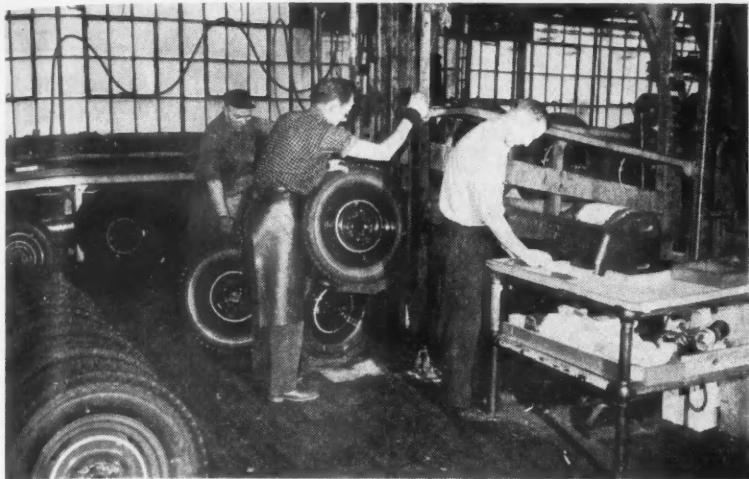
*(Left) Sample of card for processing in the teletype machine and transmitting to the receiving stations in various parts of the plant.*

*(Below) Here is the central scheduling station with its two teletype machines. The cards in front of the operator are car building specifications issued by the planning department*

EXCEPT for those concerned with planning motor car production schedules few people realize the many combinations of color, accessories, body styles, and other options such as gear ratio, steering gear, etc., represented by an average day's output of the final assembly line. An excellent example of modern practice is found at Dodge Main, division of Chrysler Corp., in many respects typical of how this job is done.

Scheduling of the final assembly line and its component feeder lines is done from a central dispatching office containing two main transmitters. Dodge uses the teletype system, the transmitters being directly connected to each of 17 key stations in the plant. In considering the operation of scheduling it must be borne in mind that although parts and sub-assemblies are made by mass production methods, the final car is actually a tailor-made product built exactly to the requirements and specifications of the customer. His order specifies the body type, color combinations, trim, accessories, and a choice of such optional equip-





To show a typical receiving station, here is the teletype receiver at wheel scheduling.

special form used in the transmitter (see sample card). As the cards are typed by the operator, the information is transmitted simultaneously to each of the 17 receiving stations. Each card is given an arbitrary "Job Number" which appears in the upper left hand corner.

As the message is received the operator at each station uses the card to select and identify the part for the specific car, the card being securely

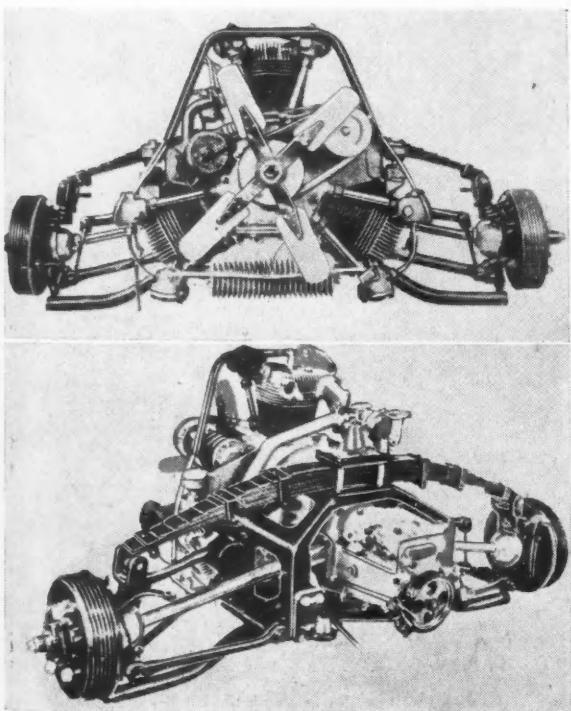
affixed to the chassis frame or trimmed body or engine. Thus identified the selected parts are placed on their conveyors in the same sequence as the job number. Hence one can visualize a stream of bodies moving to the body drop, chassis moving on the final line, fenders and other sheet metal, axles, steering gear, etc., flowing from the point of origin to the final assembly line. Each of these conveyors selects a path which ultimately reaches the assembly line at the point of

(Turn to page 44, please)

ment as may be offered. All of this must be built into a specific car while it is moving on sub-assembly or final line conveyors.

The process starts with master cards for each car to be produced during the course of the given day, these being prepared by the planning department in accordance with instructions from the distribution department. These cards are delivered to the central transmitters, in the required order of precedence, the information then being transferred by typing the

## Italian Ninfea Car Equipped with Radial Engine and Front Drive



**A** LIGHTWEIGHT Italian five-passenger car, the Ninfea, which is built by O.P.E.S. in Turin, utilizes a special frameless construction and a unique radial three-cylinder air-cooled engine with front-wheel drive. The body, a rigid box-like structure, is used as the frame; and the engine, clutch and transmission, as shown in the accompanying photos, are mounted in a stamped-plate frame which is joined to the cantilever spring and the body at a point above the transmission casing.

The three-cylinder engine develops 20 hp at 3600 rpm with a displacement of 42.8 cu in. and a compression ratio of 6 to 1. Bore is 2.56 in.; and stroke is 2.76 in. for one cylinder, and 2.79 in. for the other two. Valves are in the head.

The differential is placed between the friction clutch and the transmission, with power transmitted to the front wheels by two short shafts. Four speeds forward and one reverse are provided. Shifting is accomplished by a lever on the steering post.

Front suspension is by (Turn to page 96, please)

(Above) Front view of the engine and suspension of the lightweight Ninfea.

(Below) This rear-quarter view of the Ninfea's front end shows the cantilever spring and planar suspension system.

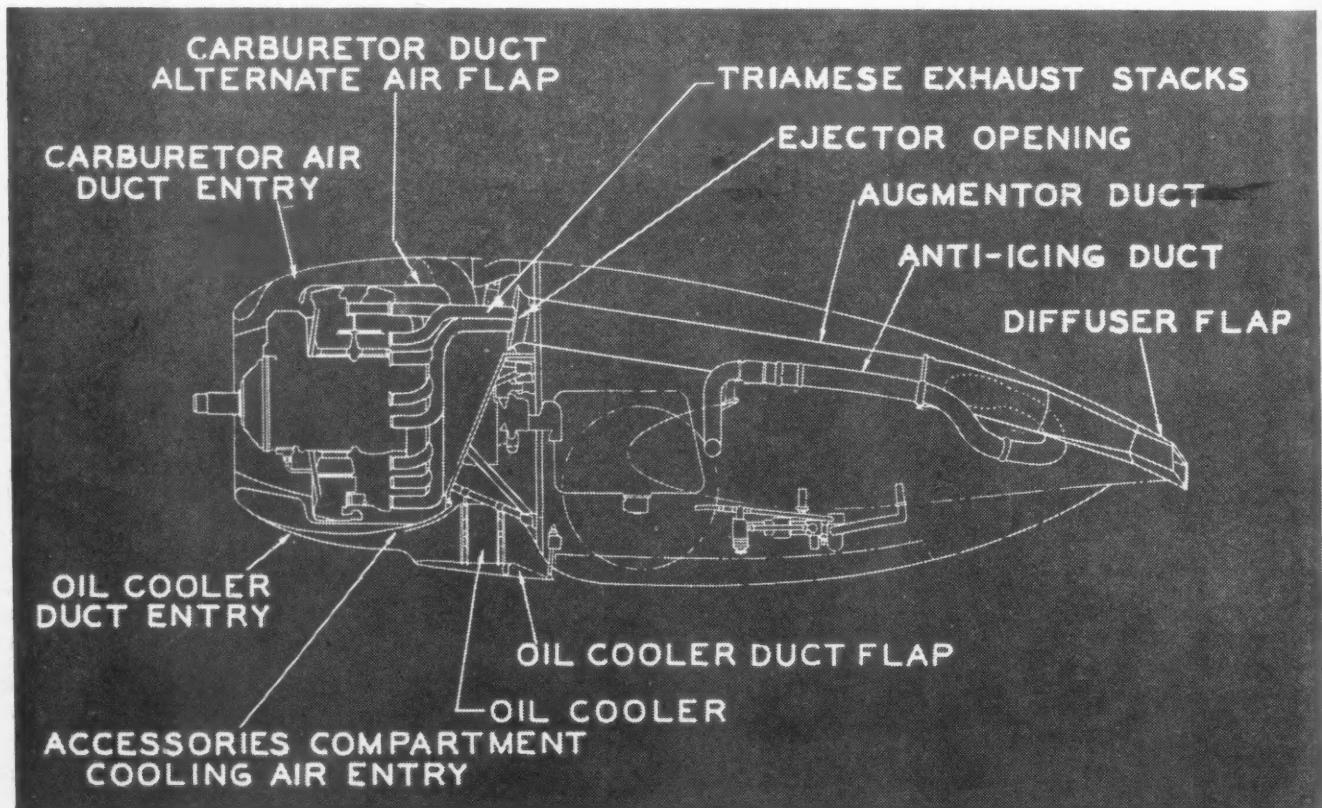
# *Foresee Wider Use of* Exhaust Jet C

**J**ET ejector cooling, utilizing engine exhaust to provide air-pumping action, is one of the most promising new developments in aviation. It has been proved completely satisfactory for the cooling of reciprocating engines both theoretically and by a substantial number of experiments and practical installations, and it accomplishes this job at an astonishing reduction in cooling drag and power. Certain installations actually provide increased thrust for propulsion purposes.

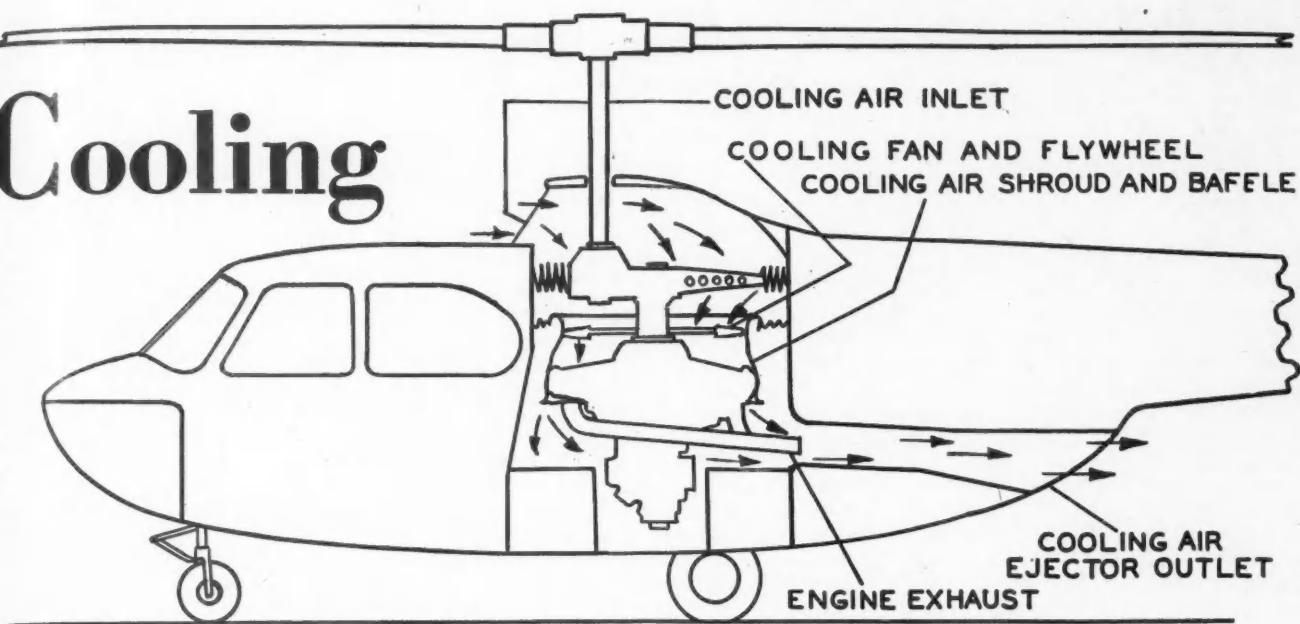
The system is now finding application to production aircraft and experts agree that its use will expand in the coming months to predominance over existing methods. Of additional interest is the fact that its advantages are applicable to the automotive field and to a wide range of applications where power-plant cooling is difficult either through critical temperatures or excessive power losses.

Jet ejector cooling accomplishes the identical purpose of forward airspeed in an aircraft power plant installation, although in a radically different way. It therefore provides adequate cooling for an airplane or other vehicle while standing on the ground or moving at low forward speed. Engine cooling requires a fluid flow across the heated cylinders in such a manner that the heat is transferred from the cylinders to the fluid and, subsequently, dissipated into the atmosphere. Conventional aircraft cooling systems create a pressure differential across the engine through the use of the ramming effect of the incoming air. This low-pressure, high-velocity air is slowed through tight cylinder baffles into stagnation aft of the engine at higher pressure.

*Exhaust ejector system on the Convair-240 airplane.*



# Cooling



*The jet-ejector cooling system used on the Bell model 42 helicopter. In this design the ejector is supplemented with a fan to provide full cooling. This cooling fan also serves as a flywheel.*

A circumferential slot aft of this point decreases this pressure and increases the air velocity by passing it through a restricted opening into the airstream. Cowl flaps, however, achieve this flow by stalling the flaps, thereby created drag increases and consequent expenditure of engine power. Jet ejector cooling creates these conditions faithfully by creating a low-pressure area forward of the cylinders and a high-pressure area aft of the cylinders. In effect, the conventional engine cowling "pushes" the air through; the jet ejector system "pulls" the air through.

The purpose of the jet ejector is to induce a flow of low-pressure air into a region of high-pressure air. This is accomplished by using the engine exhaust flow as the energizer for the action. A simple nozzle is placed directly aft of the end of the exhaust pipe. The high-velocity, low-pressure exhaust stream induces a flow of air from the surrounding region, which is at a higher pressure than the exhaust stream. Aft of the nozzle inlet is a short portion of nozzle which mixes the two streams, converts a portion of the exhaust velocity into pressure and a portion of the air pressure into velocity, the resultant being an efflux of mixed gas and air. The divergent portion of the nozzle expands this efflux to atmospheric pressure by converting all of the stream velocity into pressure.

**By Larry McRoberts**

The total result is a pumping action on the original air in such a manner that a continuous flow is induced. By proper design of the system and its operation under specified conditions, the efflux may be made to exit at a higher pressure than the surrounding air, resulting in a net thrust on the system.

Jet ejector cooling answers most, if not all, of the historic aircraft engine cooling problems. Chief of these has been the difficulty in providing adequate cooling to the engine on the ground or climbing at high power output. Both of these conditions are critical, the former due to lack of sufficient airflow at low or zero forward speed and the latter due to a combination of low forward speed and high engine cylinder temperatures. Adequate provisions for these two conditions most often result in excessive cooling at aircraft operating speed and altitude. Jet ejector cooling provides the solution to both of these operating conditions due to its complete independence of the forward speed of the airplane. Certain tests, as a matter of fact, have revealed that jet ejector cooling is almost independent of ram pressure at the high speed end of the scale. By thus providing adequate engine cooling, the jet ejector permit higher power from the engine, decreases fuel consumption, increases the time between engine overhauls and decreases the likelihood of piston failure and the breakdown of the oil film between

*(Turn to page 74, please)*

# Airbriefs

by Robert McLaren

## Speed Record

Two factors made possible the 623.8 mph speed record of the Lockheed P-80R— aerodynamic redesign and added power. A thinner wing section was used, which reduced drag and, more importantly, raised the critical compressibility speed to a value somewhere above that of the speed attained during the passes over the course. New flush-type air inlets are fitted in the wing roots. The engine is the new Allison Model 400, which produces 4600 lb of thrust, has a specific fuel consumption of 1.12 lb per lb-thrust per hr and weighs 1735 lb.

## Jet Impressions

The long-secret Muroc Army Air Base in California was revealed to members of the aviation press last month with a flying display of the latest Army and Navy jet aircraft. Your Air Briefs editor was impressed with the initiative of the services and the industry in "going ahead" with multi-jet bombers, but equally impressed with the considerable development work lying ahead on the types. The North American XB-45 four-engined jet bomber and the same firm's XFJ-1 Navy fighter were easily the most impressive of their types shown in speed, maneuverability and tactical qualifications. Both have been ordered in quantity and this decision was fortified by the demonstration.

Also impressive was the Douglas XB-43, a twin-jet version of the famed Mixmaster, which, despite its awkward appearance, proved fast and maneuverable. The sleek and seemingly "perfect" Consolidated-Vultee XB-46 proved comparatively slow. The Vought XF6U-1 Pirate presented an attractive appearance with its smooth "Metallite" skin, but was not exceptionally fast. The Northrop N9M (1/3 scale model of the XB-35, which was laid up for repairs in the hangar) flying wing astonished the visitors with its odd appearance, but obviously satisfactory flying qualities. As a preview of next year's production models, the show was memorable, but the salient fact that we have only ONE of each of these types is indicative of the job ahead if we are to have a jet air force soon.

## Research Aircraft

Both the Bell XS-1 and the Douglas D-558 sonic research airplanes were flown at Muroc as graphic evidence of this nation's progress in highspeed flight ranges. The XS-1 was dropped from its Boeing B-29 "mother" plane at 22,000 ft and made a flight lasting some 20 min with each of the four rocket engines fired in sequence. Chalmers "Slick" Goodlin piloted the tiny craft at 600 mph, drawing away readily from an accompanying Lockheed P-80 during the demonstration. The 20-flight provision of Bell's contract has now been complied with and the serious research phase of the program under guidance of the National Advisory Committee for Aeronautics is now under way. The Douglas D-558 proved a conventional, easy-to-handle aircraft with impressively sleek lines and a business-like approach to the problem. It is powered by a G-E TG-180 turbojet engine, permitting takeoff and taxiing under its own power. Although flown at only about 350 mph during the demonstration it appears thoroughly capable of sonic speed and easily the fastest aircraft now flying in the nation.

## Wright Turbine

The new Wright gas turbine engine, now in assembly line production with no data yet released for publication other than the fact that it will develop an output equivalent to the 8800 horsepower of a B-29, will be flight tested in the nose of a special Boeing B-17. The new Wright laboratory at Wood-Ridge, N. J., is now in operation and is claimed to be the largest laboratory ever operated by private industry for governmental research. Customer for the engines has not yet been announced but it is assumed to be the AAF.

## B-36 in Production

"They said it couldn't be done, but we're doing it!" That is the general feeling of the Fort Worth (Texas) Division of Consolidated Vultee with reference to the production line on the

world's largest bomber. The new B-36A, of which 13 are now on the final assembly line with 87 to follow at one per week after acceleration to this figure, has been redesigned into a number of major assemblies, replacing the single-unit fuselage and wing of the prototype XB-36. The new four-wheel main gear assemblies will enable the 160-ton giant to operate from any field capable of accommodating the Boeing B-29. The size and weight of the bomber posed innumerable production problems. Following mating of major assemblies, overhead cranes cannot be used so the landing gear is installed early in the process to permit supporting the craft as it moves along the line. The 230-ft span requires canting the bombers in the 200-ft wide assembly building. What might appear a major problem (the 46-ft 7-in. height of the fin in a 44-ft unobstructed height) has been easily and simply solved. The bombers are so located that each station places the tail in a between-truss position. When the airplane must be moved, the nose is jacked up on a mobile dolly, thereby lowering the tail and permitting the plane to be moved down the line. First delivery is scheduled for this month with the order for 100 due for completion by June 30, 1949.

## Australian Production

Australia is now in quantity production on Rolls-Royce Nene turbojet engines, DeHavilland Vampire jet fighters, Avro Lincoln four-engine bombers and Avro Tudor transport planes, all for the government. Upon completion of current commercial air mail contracts, the government will take over all air mail routes.

## Flying Wing Future

John K. Northrop, in his delivery of the 25th Wilbur Wright Memorial Lecture in London, revealed that the XB-35 is only another step in what promises to be a long progression of all-wing aircraft. In comparison with conventional aircraft, the Flying Wing flies 7-15 per cent faster, requires 20-30 per cent less power, has 41-60 per cent less drag and can fly 30-50 per cent farther. He revealed numerous teething troubles of the design (including an inadvertent upside down flight of an early model which continued under perfect control even after the pilot had jumped by parachute!) as well as numerous inherent problems of the design that will always require special controls and design techniques. The counter-rotating Hamilton Standard propellers of the XB-35 are now being replaced by single-rotation Curtiss designs, requiring extensive reworking of the engine and propeller shaft gear boxes. The jet-propelled YB-49 should be flying this fall.

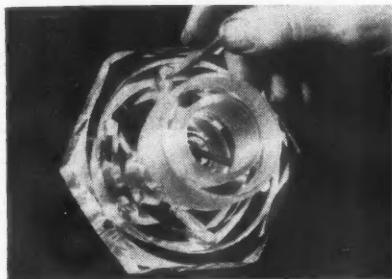
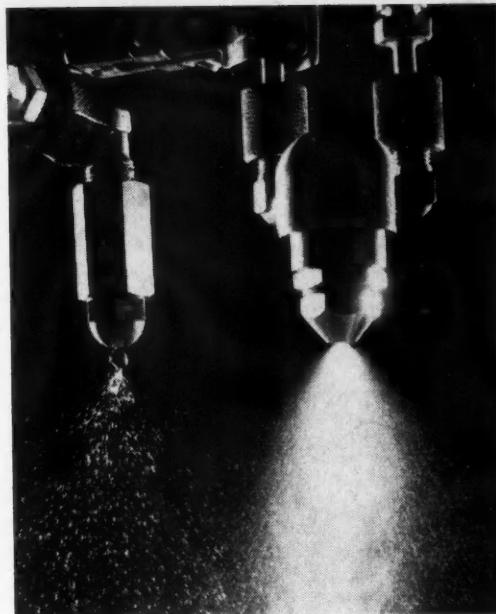
(Turn to page 92, please)

# New Fuel Nozzle

## Utilizes Compressed Air

**A**FUEL nozzle for gas turbines, recently perfected by Westinghouse Research Laboratories, utilizes the flow of low-pressure compressed air to provide a solid cone fuel spray. The new nozzle, which is said to perform effectively below the drizzle point of a conventional nozzle, will be used on the new 2000 hp gas turbine generator set now under experimental development at the Westinghouse South Philadelphia Works. It is intended for locomotive, marine and utility applications.

The nozzle, shown in the accompanying photo, contains six tiny air-ducts cut at an angle in the atomizer. A small flow of relatively low-pressure air, less than one cfm, passes through these ducts, collides with the incoming fuel supply, and disperses the heavy oil into droplets the size of fog particles.



(Above)—

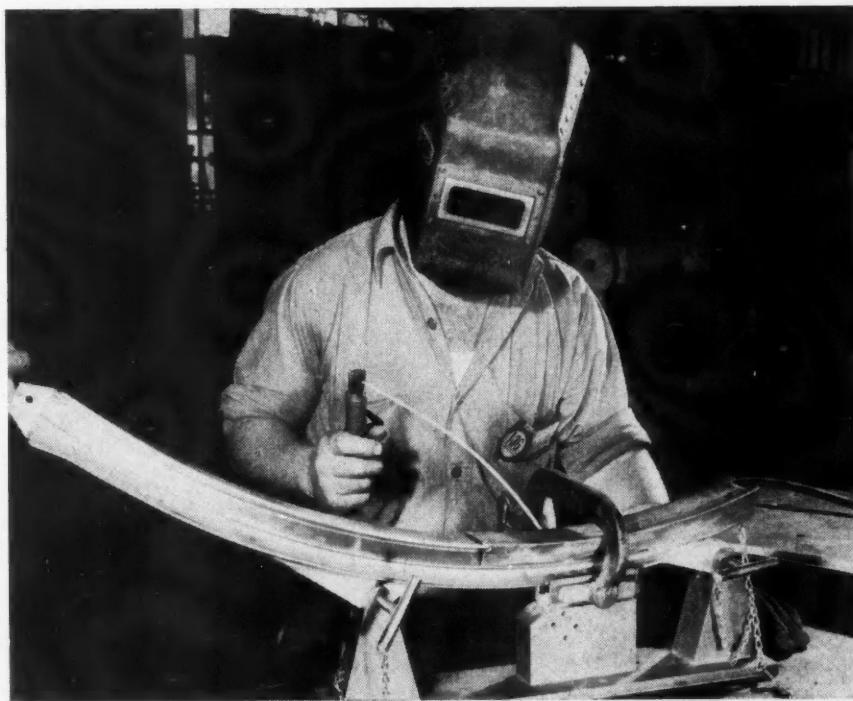
*This high-speed photo contrasts the spray of a conventional mechanical nozzle (left) with that produced by the new type developed at the Westinghouse Research Laboratories. Both nozzles are under five psi pressure.*

(Left)—

*Plastic scale model of Westinghouse fuel atomizer for gas turbines. Compressed air, forced through the small passages, collides with the incoming fuel and breaks it up into a fine spray.*

# Arc Welding Modifies Flaptrack

**A** STANDARD flaptrack used by Consolidated Vultee Aircraft Corp., San Diego, on a number of its different type airplanes was adapted to the special requirements of the new Convair-240 by the method illustrated, according to the Lincoln Electric Co., Cleveland. The fixture shown exactly positions the standard part for arc welding on a holder plate attachment. The flaptracks are of molybdenum steel, highly heat treated. Stainweld A5 electrode is used, and five skip-welds, approximately  $\frac{3}{8}$  in. apart are made. The Convair-240 has five flaptracks for each of its two flaps, all of which are heavily loaded. By this application of arc welding, the company was able to re-work a standard part in stock and was saved the expense of making a newly-designed flaptrack.

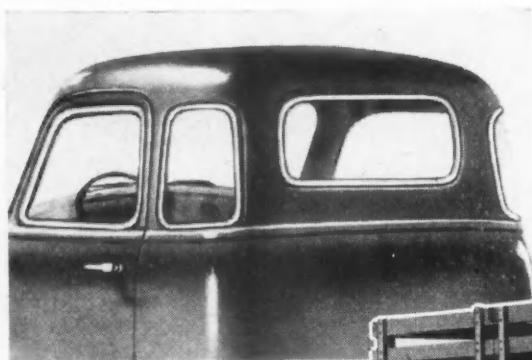


*Light-duty canopy express of the new GMC line of gasoline engine trucks. This model is available in a 116 or 137 in. wheelbase, and in capacities of  $\frac{1}{2}$  and 1 ton.*



# Light and Medium Duty Line of Trucks

**FC Series Consists of Variety of Body Types, Special Milk Delivery Chassis and Tractor Group, with GVW Ratings from 4600 to 20,000 Lb. COE Models Ready Soon.**



*The new line of light and medium-duty models feature all-steel cabs with increased comfort and safety. The deluxe cab, pictured here, introduces the rear quarter windows which, in combination with the larger rear center window, is said to increase rear vision by 137 per cent.*



*New GMC stake truck. It is available in nine models of 125 $\frac{1}{2}$  in., 137 in. and 161 in. wheelbases, in capacities of  $\frac{1}{2}$ ,  $\frac{3}{4}$ ,  $1\frac{1}{2}$  and 2 tons.*

THE GMC Truck and Coach Div., General Motors Corp., has brought out its FC line of light and medium-duty gasoline engine trucks featuring many mechanical improvements, enhanced eye appeal and increased driver comfort. As shown on the specification chart, the line consists of a variety of body types in a range of capacities, including pickups, canopy express, panels, suburbans, stakes, platforms, special milk delivery chassis, chassis with cab and a special tractor group.

The GMC Truck and Coach Div. also states that a

new line of C-O-E models will be released shortly, incorporating all of the mechanical improvements described here.

Three standard GMC valve-in-head engines, greatly improved for postwar application are used in this line. These are: the 228, the 248, and the 270, a larger displacement engine replacing the previous power plant on some of the models as noted.

The FC-100 series  $\frac{1}{2}$ -ton and FC-150 series  $\frac{3}{4}$ -ton models with 4600 lb and 5800 lb rated GVW respectively use the 228 cu in. engine, longer front springs, and steering gear ratio increased from the previous 19.8 to 1 to 26.2 to 1. On FC-150, full floating rear axles having a ratio of 4.57 to 1 replace the former semi-floating type.

The FC-250 Series, GVW has been increased from 7000 to 8800 lb. This group uses the 228 cu in. engine, 45 x 2 in. front springs, and front brakes upped to 12 x 2 in. The heavier front

axle carries a rating of 3500 lb, contrasting with the former rating of 2000 lb. Steering gear ratio is raised to 26.2 to 1. Rear springs are an inch longer and are of progressive type. A new  $1\frac{1}{2}$  ton, four-speed transmission is installed. These models are fitted with hypoid rear axles having a ratio of 5.14 to 1 and have banjo type housings. Standard wheels are 17 in.; 18-in. wheels are optional.

A new model, the FC-280, replaces the former 300 and carries a GVW rating of 11,000 lb. This model, equipped with the 228 cu in. engine, has a front axle rating of 3500 lb and steering gear ratio of 27.7 to 1. It comes with a four-speed transmission and a hypoid rear axle of 5.43 or 6.17 to 1 ratio with a load rating of 9000 lb.

The FC-300 Series is rated 13,000 lb GVW and is fitted with the 248 cu in. engine, replacing the 228 formerly used. Front springs are 45 x 2 in., and steering gear ratio is increased to 27.7 to 1. The rear-axle track is two in. wider, and auxiliary rear springs are standard. The hypoid rear axle with a ratio of 5.43 or 6.17 to 1 has larger wheel bearings and axle tubes. The two-speed axle is optional.

The FC-350 Series with 15,000 lb GVW rating has the 248 cu in. engine, replacing the former 236. The front-axle track

(Turn to page 88, please)

# Introduced by GMC

## GMC Gasoline Truck Specifications

Type and Model	Wheelbase (in.)	Maximum GVW Rating (lb.)	Nominal Rating (ton)	For Loads up to: (lb.)	Body Length (ft.)
<b>Pickups</b>					
FC-101.....	116	4,600	$\frac{1}{2}$	1465	$6\frac{1}{2}$
FC-102.....	125 $\frac{1}{4}$	4,600	$\frac{1}{2}$	1430	$7\frac{1}{2}$
FC-152.....	125 $\frac{1}{4}$	5,800	$\frac{3}{4}$	2530	$7\frac{1}{2}$
FC-253.....	137	8,800	1	4885	9
<b>Canopy Express</b>					
FC-101.....	116	4,600	$\frac{1}{2}$	1175	7
FC-101 de luxe.....	116	4,600	$\frac{1}{2}$	1175	7
FC-253.....	137	8,800	1	4550	9
FC-253 de luxe.....	137	8,800	1	4550	9
<b>Stakes</b>					
FC-102.....	125 $\frac{1}{4}$	4,600	$\frac{1}{2}$	1140	7
FC-152.....	125 $\frac{1}{4}$	5,800	$\frac{3}{4}$	2240	7
FC-253.....	137	8,800	1	4370	9
FC-281.....	137	11,000	$1\frac{1}{2}$	6170	9
FC-283.....	161	11,000	$1\frac{1}{2}$	5950	12
FC-301.....	137	13,000	$1\frac{1}{2}$	7570	9
FC-351.....	137	15,000	2	9170	9
FC-303.....	161	13,000	$1\frac{1}{2}$	7356	12
FC-353.....	161	15,000	2	8950	12
<b>Platforms</b>					
FC-253.....	137	8,800	1	4620	9
FC-281.....	137	11,000	$1\frac{1}{2}$	6420	9
FC-283.....	161	11,000	$1\frac{1}{2}$	6250	12
FC-301.....	137	13,000	$1\frac{1}{2}$	7820	9
FC-351.....	137	15,000	2	9420	9
FC-303.....	161	13,000	$1\frac{1}{2}$	7650	12
FC-353.....	161	15,000	2	9250	12
<b>Panels</b>					
FC-101.....	116	4,600	$\frac{1}{2}$	1155	7
FC-101 de luxe.....	116	4,600	$\frac{1}{2}$	1155	7
FC-253.....	137	8,800	1	4490	9
FC-253 de luxe.....	137	8,800	1	4490	9
<b>Suburbans</b>					
FC-101.....	116	4,600	$\frac{1}{2}$	1020	7
<b>Special Milk Delivery Chassis</b>					
FC-251.....	116	8800	1	6	30 to 40
FC-252.....	125 $\frac{1}{4}$	8800	1	8	50 to 60
<b>Type and Model</b>					
<b>Chassis with Cabs</b>					
FC-401.....	137	17,000		11,200	
FC-451.....	137	18,000		12,200	
FC-471.....	137	20,000		13,600	
<b>Type and Model</b>					
<b>Special Tractor Model</b>					
FC-301.....	137	60	22,000	$1\frac{1}{2}$	
FC-302.....	149	72	22,000	$1\frac{1}{2}$	
FC-303.....	161	84	22,000	$1\frac{1}{2}$	

# Observations

by Joseph Geschelin

## Steam for Buses

**E.** B. NEIL's paper on the steam engine for buses finally brought out in the open something which has been under cover for the last year or more. The adoption of automotive design practice, the availability of new materials, and a studied research of the thermodynamics of steam power—all have combined to create a renaissance of interest in a phase of automotive activity long dead. Apparently the principals backing this enterprise—not yet disclosed—have reason to believe that certain bus producers are ready for steam right now.

## Heavy Duty Gearing

**C**ONTINUING a high batting average as one of the foremost research men in his field, J. O. Almen of General Motors Research presented a review of work done in studying the design of heavy duty gearing with particular reference to aircraft gears. Of more than passing interest was his comment that aircraft gearing falls short of the performance of motor car and truck gearing. Usually people like to think of aircraft practice as being far in advance. Almen's talk was presented from notes and slides since the paper had not yet been written. It will make good reading when finally off the typewriter.

## 500 Mile Race

**S**IGNIFICANTLY the two front drive cars designed and built by Lou Moore came in first and second, Mauri Rose making but one pit stop while Holland made two. Among the other cars, tire changes, particularly at the front were quite frequent. Oil line and gasoline line failures took their toll. The much heralded Mercedes did not finish—a victim of a broken piston which fortunately cracked at the skirt without causing extensive damage to the engine. Otherwise there were several magneto failures, one timing gear chain, only one failure of an axle or transmission, and one radius rod failure.

## Decision on Polaroid

**A**LTHOUGH engineers have been looking for improvement in headlamps for many years, the sealed beam lamp remains the best answer to date. In the background has been an impressive period of development of the Polaroid system which has undergone some major improvements since its introduction. The question now is whether or not Polaroid will be adopted by the industry and its use enacted into law.

Although nothing has appeared in print, in recent months a comprehensive demonstration was held on the GM Proving Grounds. Engineers have driven cars equipped with Polaroid for hours, at night, as drivers and passenger-observers. We learn, unofficially, that the stage is set for a similar demonstration before the group of motor vehicle administrators whose reaction will have an important bearing upon state legislation.

Briefly this is the present status of Polaroid so far as we can learn. The first problem is light intensity on the road. Since polarization of light reduces the effectiveness of the light source, the intensity of headlamps has been increased progressively to the point where it takes a 125-watt bulb and that may not be enough. To supply that much energy the electrical system of the car must be greatly increased, marking a sizeable added cost per car.

It was thought originally that the optical system should be composed of a polarizing lens and a Polaroid windshield. Since the cost of the windshield would be high, later thinking has been to use a simple Polaroid viewing screen on the sun visor. This has several advantages apart from lower cost. If the windshield were entirely of Polaroid, the driver's view of the road under most conditions except in strong sun would be quite obscured. Even in night driving it would be better to look through plain glass except while subjected to on-coming Polaroid beams.

With the increased intensity of the Polaroid headlamp, there is a possibility that it will dazzle front and rear seat passengers who may view the light through clear glass. There will be the same effect upon the drivers of cars not equipped with Polaroid viewing screens. Consequently, it may be necessary for all cars, at least those that drive the highways at night, to

be fitted with a Polaroid screen. Furthermore, the driver of a Polaroid car may require a viewing screen at the side to shield his eyes from cars coming at the side.

It all adds up to a considerable problem—and the prospect of an important increase in cost. But the need is a serious one and by all accounts Polaroid offers the only solution if we disregard the economics. On the other hand, it is hoped that the matter will be resolved by engineers and management rather than by political expediency. In the orderly process, if the industry through the AMA decides that Polaroid is essential and practical; and if, following such decision, the motor vehicle administrators are sold on the idea as in the public interest, then and only then should legislative action be taken.

## Small Output Gas Turbines

**O**N SEVERAL occasions in recent years we have commented on the gas turbine as a potential automotive power plant, although at the time no one had built units small enough for the purpose. We learned recently that a number of organizations in the aircraft field have given the matter attention and have actually built gas turbines from 100 to 250 hp. for private plane use. That is the type of power plant that could be of interest for motor trucks and buses. However, the gas turbine still requires a great deal of practical development. The small units run all right but their fuel economy is terribly poor judged by road transportation standards. Unless economy can be greatly improved the gas turbine at this stage can hardly be considered as competition for Diesel or gasoline engines.

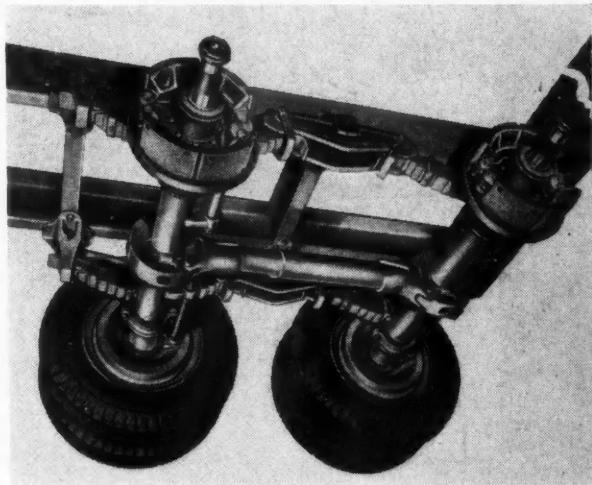
## V-8 Engines

**P**ROBABLY every passenger car builder in the industry, with little exception, has been playing with V-8 engines. One of its merits is a short crankshaft—an advantage in rigidity with increasing compression ratio, and offering compactness if engines move to the rear. Of course, there is nothing startling in a move to V-8's. Ford has used V-8 for many years and is reported grooming a new series of larger output engines for the next season. Cadillac has had a V-8 for many years. The Oakland car had a V-8 engine just before it became Pontiac not so many years ago. And there was a spell when Olds produced the Viking 8. Of course with the passage of years, the industry has learned how to build V-8's better than ever before, and at less cost.

## Bantam Tandem Axle Model

### *Features Intra-Axle Torque Tube*

A NEW series of standardized truck-trailer models, developed by the American Bantam Car Co., Butler, Pa., features a "free-floating" type of spring suspension and tandem axles with a tubular steel torque member mounted between them. As shown in the photo, the four high-capacity springs are mounted on axle journals in a manner that permits free forward and backward action without distorting their proper load-carrying position. The intra-axle torque tube is cushioned in rubber and prevents braking forces from being transferred to the second axle or through the springs. Thus, it is claimed, load transfer, wheel bounce and brake chatter are eliminated. Adjustable radius rods are provided for axle alignment. The axles are supplied by the Standard Forge and Axle Co., Montgomery, Ala. New Bantam models include various body styles, lengths and capacities, and chassis.

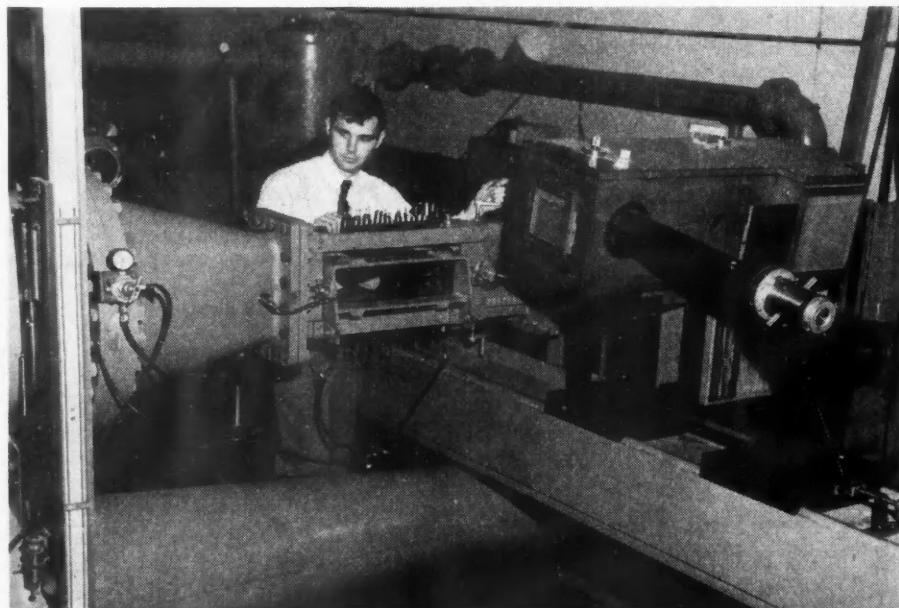


## *Supersonic Wind Tunnel*

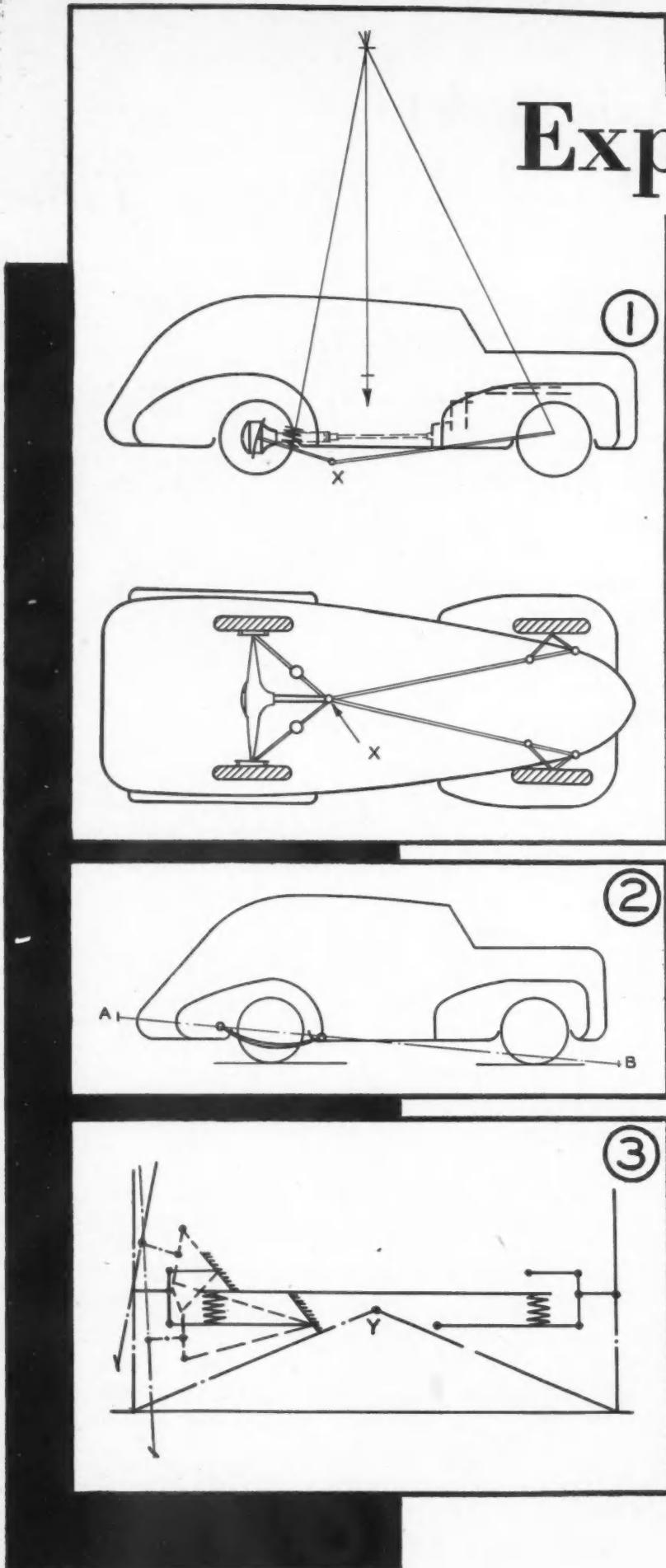
RECENTLY placed in operation at North American Aviation, Inc., is a supersonic wind tunnel which is said to be the first of its kind in the West Coast aircraft industry. The company is using the tunnel to accelerate its program of research and development in

supersonic guided missiles. Nozzles have been designed by North American engineers to permit tunnel operations at Mach numbers from 1.25 to 3.25 (corresponding to sea level velocities of from 950 to 2500 mph). A complete Schlieren optical system is being used to allow visual and photographic records to be taken of the shock wave pattern in the air stream around the test models.

The unique feature of the tunnel is an adjustable air diffusing mechanism in the exhaust section which it is claimed, permits a higher air speed for a fixed initial air pressure used than any other tunnel in the United States. Air supply for the tunnel is obtained from the plant compressed air lines, and after filtering and drying, the air is expanded through the test section, which is 1.75 by 4.5 in. in dimension. Basic research also is being done on airfoils.



# Experimental S



**A**N experimental suspension system, developed by Opel in Germany just prior to the war, aimed at improving the riding qualities, roadability, and steering of current designs through the elimination of undesirable torsional moments on the car and its roll-center.

The system has individual front wheel suspension, with the axis of the wheel carrier arms intersecting at a point below and ahead of the solid rear axle, which point is also the anchorage for the forwardly converging radius rods from the rear. The rear suspension consists of a coil spring at each side, transferring its load to the radius rod. Each coil spring is naturally inclined so that its axis is normal to the radius rod under static conditions. Extensions of all spring centers meet on a vertical line passing through the car's center of gravity, as shown in Fig. 1. Thus, all outside forces torsionally stressing the roll-center and the car are eliminated.

When a car is rocked sideways and photographed in various positions from the front and rear, a neutral point of motion is found. Connecting the front with the rear points gives the roll-center, *A-B* in, Fig. 2. Locating the rear spring eyes on this roll-center line eliminates the undesirable torsional moment.

Determining the roll-center with the aid of a drawing is illustrated in Fig. 3 and done as follows: the perpendicular to the tire center in various up and down positions intersects with point *Y* of the center line of the

**Fig. 1**—This experimental suspension system, developed by Opel, eliminates torsional moments on the car by arranging the springs so that extensions of their centers meet on a vertical line passing through the car's center of gravity.

**Fig. 2**—The roll-center of the car is shown by line *A-B*

**Fig. 3**—This drawing illustrates how the roll-center is determined

# al Suspension System

*German Design Eliminates Torsional Moments on Passenger Cars*

By Austin M. Wolf,

Automotive Consultant

car, that is, a change of tread caused by spring action is a factor of roll center height. Without tread change during spring action the roll-center lies on the ground.

Referring to the spring system shown in Fig. 3, the ratio of the spring rate for parallel motion is to uneven spring motion, at least, as tread distance is to the spring center distance. That is, with a normal spring rate of 133.6 lb per in. the curve spring rate will be less than 112 lb per in. In reality, the car tries to follow its least resistance; it bounces uneven and shows a pronounced lateral inclination in curves. With an independent spring system, like the S. L. A. suspension, the curve rate is equal to the parallel rate.

Experimentally, the spring system illustrated in Fig. 4 was selected. The before-mentioned does also hold good for this system. It must be added that the ratio  $A$  to  $B$  squared becomes manifest.

The formula of the parallel rate is equal to the spring rate.

The formula of the curve rate is

$$= \text{spring rate } \frac{A}{B} \times \frac{A'^2}{B'^2} \div \frac{A^2}{B^2} \times \frac{A'^2}{B'^2}$$

(Turn to page 84, please)

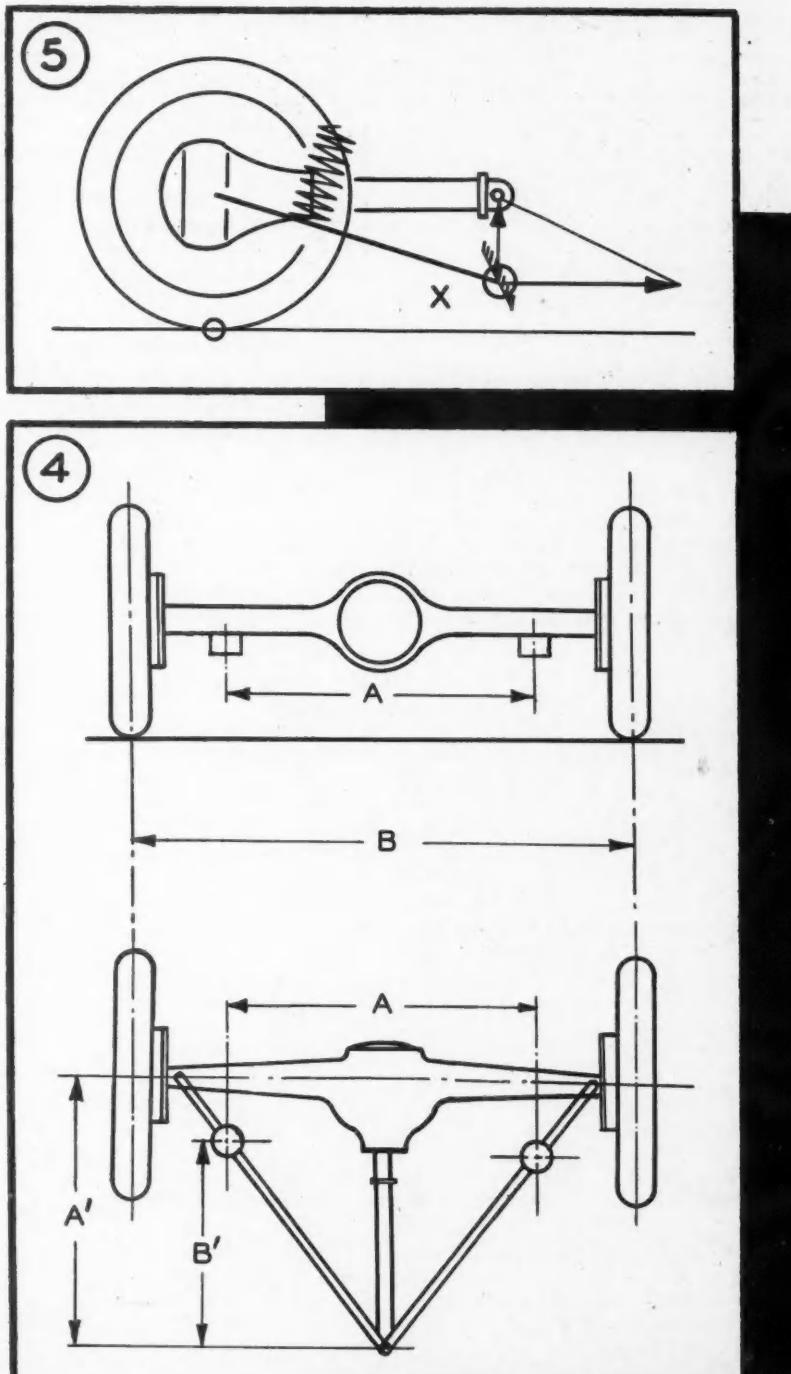


Fig. 5—The connecting line between the pivot points of the front wheel carrier arms meet at point X, the intersection of the rear radius rods, which is located lower than the wheel center. Thus, torsional moments are eliminated from the roll-center, and good understeering is obtained

Fig. 4—Rear spring system of the experimental Opel suspension

# Tailor Made Cars by Teletype

(Continued from page 33)

application, and at this time the parts and bodies and chassis have job number tickets corresponding to the sequence in which each car is scheduled to be built. Not only are the proper parts moving in their proper order but the conveyors that transport them travel at speeds synchronized with the speed of the final line. More specifically the key stations at Dodge may be noted as follows:

Chassis frames on the second floor  
Beginning of the chassis line on the first floor  
Rear axle assembly on the first floor  
Chassis conveyor on second floor  
Engine final line on second floor  
Production office on second floor  
Wheel paint on second floor  
Wheel and tire assembly on second floor  
R.H. Fender storage on fourth floor  
L.H. Fender storage on fourth floor  
Rear gravel shield on third floor  
Bumper conveyor on first floor  
Cushion trim on third floor  
Two cushion delivery stations on third floor  
Hood delivery on second floor  
Body and fender assembly on third floor

The master transmitter is located on the third floor. Incidentally the listing above does not indicate the order in which parts are delivered to the assembly line.

Let us consider some of the details of the operation. Body fabrication is independent of the final line schedule since body stampings must be made in lots of large quantities. Thus body fabrication is a continuous process

established by the planning department considerably in advance of daily production to maintain a uniform flow. The same applies to fenders and other sheet metal, engines, axles, etc. Component parts production is a function of advance planning designed to make available the proper balance of units required to maintain the daily output of the final assembly line.

Similarly the painting of bodies and sheet metal and wheels is based upon advance estimates by the planning department since it is more economical to make runs of the same color in advance than it is to change repeatedly from one color to another. Consequently, in the case of painted parts and bodies, certain average runs of each of the wanted colors are put through and then the proper color selected from the bank or the line to fill the specification. Thus fenders are stored in banks already painted in a variety of colors, making it an easy matter to select the color according to the teletype job number.

Bodies become subject to final line scheduling as they are completed in the trim shop ready for the body drop. The chassis for a particular body was earmarked some time earlier by selecting the proper frame for the chassis line. Sheet metal of proper color to match the body has been selected and mounted on the conveyors in proper order. The proper rear axle meets the chassis line,

the correct engine and its accessories meets the line at the engine installation station, the correct steering gear is in proper sequence, etc., etc.

A distinctive feature of the Dodge assembly line is that seat cushions no longer are installed in the trim shop. It was found long ago that seat cushions took a beating while traversing the assembly line, sometimes were soiled or damaged, and always interfered with some of the assembly operations. At Dodge the cushions are not installed until the car is ready to roll off the line, at about the third station from the end of the line. To accomplish this the cushion trim line on the third floor is controlled by the master schedule as to the building program, then the delivery of cushions is scheduled at two points on the third floor, determining the order in which cushions are placed on the conveyor which travels from the third floor to the assembly line on the first floor.

This briefly is a picture of how scheduling has developed as a control of mass production assembly, automatically selecting out of thousands of possible variations the unique specifications for a specific tailor-made car. Years of experience and applied skills combine to produce a veritable marvel of coordination—rhythm in production that results in hundreds of cars rolling from the final assembly line each day.

## Electroplaters Meet and Finishers Exhibit

With a registration of over 1600 members and delegates, the 34th Annual Convention of the American Electroplaters Society, held in Detroit during the last week in June, was by far the largest event in its history. The technical program touched on the latest developments in the electroplating field, and included visits to some of the larger plating plants in the Detroit area; among these was a trip through the new Cadillac plating department. An outstanding feature of the meeting was the Industrial Finishing Exposition held concurrently in Detroit. Featuring some 135 exhibits, the Exposition covered the offerings of leading producers of electroplating, metal cleaning, buffing and polishing equipment and supplies.

In the equipment group, one of the outstanding exhibits was that shown by George L. Nankervis of Detroit, giving a pictorial view of the Pontiac plating department (to be described in an early issue of AUTOMOTIVE IN-

DUSTRIES), said to be the largest of its kind in the industry. Frederic B. Stevens of Detroit exhibited a full-scale full automatic return type small parts plating machine which is a replica of the automatic machine recently installed at Delco-Remy. Udy-lite Corp. also had an impressive layout of plating equipment and a working installation of the Udy-lite Jr., automatic conveyor plating machine.

Sturgis Products Co. showed its line of Roto-Finish equipment for wet tumbling, an advanced technique which has been widely adopted in the industry. Kold-Hold Mfg. Co. announced its new line of Platecoil linings for a variety of heat transfer applications. Bullard Co. emphasized its Bullard-Dunn metal cleaning process and showed small automatic machines of great versatility. Hanson-Van Winkle-Munning also had some scale models of large plating installations of an advanced character.

G. S. Blakeslee & Co. and Detrex

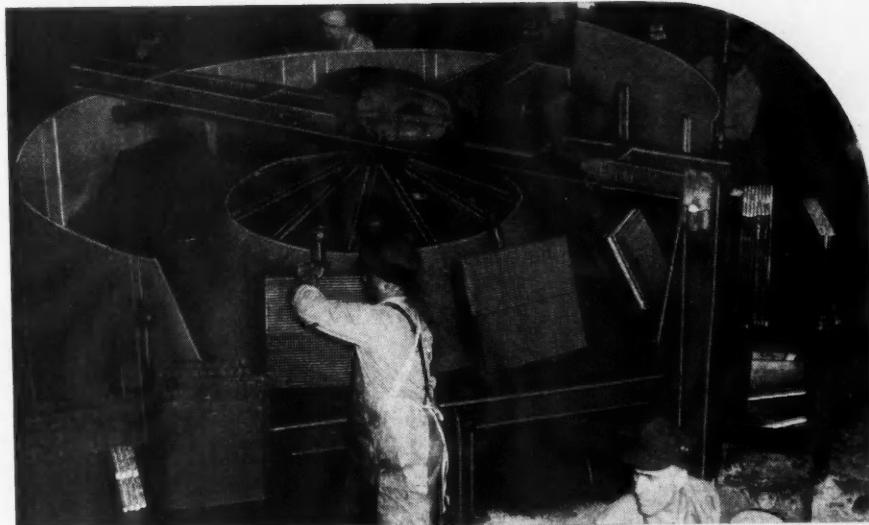
Corp. were among those who showed metal cleaning machines. Parker Rust Proof Co. had on display its latest techniques for protecting metal against corrosion. Haveg Corp. provided an interesting review of Haveg corrosion resisting equipment, demonstrating applications of the product as a construction material. Hammond Machinery Builders, Inc. and A. S. Campbell Co., Inc. displayed some of the latest developments in buffing and polishing machinery. Among the industry representatives were Electric Auto-Lite with an impressive display of plated zinc die-cast parts made for motor vehicle producers and a line of bumpers made in its new division at Sharonville, O.; Doehter-Jarvis Corp., also showed a sampling of its automotive die casting. Among the materials suppliers represented at this outstanding exhibition were International Nickel Co., Aluminum Co. of America, E. I. duPont de Nemours & Co. (Inc.).

# Ford Redesigns for Straight-Line Production of Radiators

THE Ford Motor Co. has completely redesigned its facilities for fabricating radiators and upon completion of the project will have what is considered to be the most advanced mass-production setup known to the art. Apart from the introduction of some unique ideas in fabrication lines, a major part of this advancement is credited to a revamping of the floor plan and sequence of operations. The present layout presents straight line flow of operations, improves the movement of materials from one operation to another and, in general, reduces materials handling to a minimum from the raw material to the finished product.

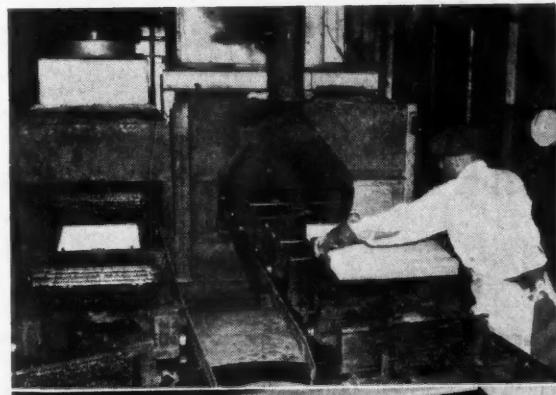
Although Ford has the advantage of high volume, the setup is quite flexible since it must handle six different types and sizes of radiators over the same lines. In addition to simplifying materials flow, the layout has been improved by the adoption of mechanization not only in the transportation of materials and parts but for fabrication lines as well. Perhaps the best example of this principle is found in the merry-go-round conveyor line—now under construction—for high speed soldering of upper and lower tanks, piping and other parts, to the core. When in operation this line will have 47 stations fitted with universally-mounted fixtures, permitting the operator to turn the work freely into every position required for convenient handling. The spacing of stations, conveyor length and speed are combined to give each operator adequate time to do his job.

Most of the new equipment  
(Turn to page 87, please)

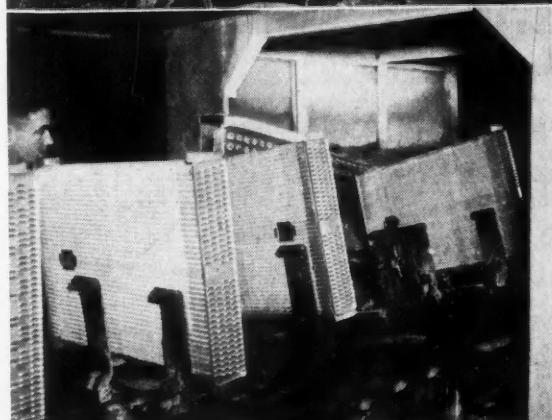


*Loading and unloading station of the new merry-go-round machine for automatic acid dip of radiator cores in the mechanized set-up recently placed in operation. The acid bath is at the right in the background.*

*Baking of radiator cores immediately following acid dip is handled in this oven. This view shows the detail of the closed conveyor for transporting cores in and out of the oven. Temperature recording instruments are on the panel at the right in the background.*



*Interior view of the header burning furnace, shows cores of various sizes moving on the conveyor which is arranged to tilt them suitably at each of the burner sections. One of the burner units may be seen in the center.*

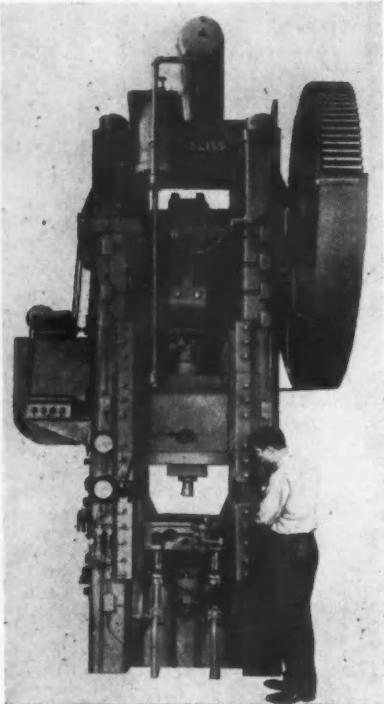


# NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 54

## E-16—Press for Powdered Metal Parts

A new briquetting press that extends metal powder application to large, irregular cross-sections has been developed by the E. W. Bliss Co., Detroit, Mich. Embodying a unique operating principle which combines the advantages of triple hydraulic lower motion—floating die table, core rod and



Bliss No. 309 briquetting press

stripper—built into a 345-ton mechanical press, the Bliss No. 309 briquetting press produces large, complex powdered metal parts beyond the size range and capacity of available single-action mechanical or hydraulic presses, and to close tolerances.

Uniform density throughout the finished part is said to be assured by the hydraulically controlled floating die table and core rod rams, which recede against pressure that is pre-determined by simple, independent adjustments. This has the effect of squeezing the powder from the top and the bottom.

The mechanically actuated slide has a 10 in. stroke, which can be adjusted to 5 in. This slide carries an adjustable cam which actuates the movement of the powder hopper.

The speed of the slide can be ad-

justed from six to nine strokes per minute and from nine to 18 strokes per minute by adjusting the speed control of a variable speed motor. The change from the low range to the high range, or vice-versa, is made by shifting a dog clutch in the two-speed gear box by means of an external lever.

All hydraulic cycles are initiated by the mechanical cycle either by contact with the die table and core rod or by a rotary limit switch except when the selector switch is set for "hand" operation, when the core rod and stripper may be moved up or down at will.

The mechanical cycle can be "inched" for set-up, "single-stroked" for tryout, or run "continuous" for production. The flexible electric timing devices make possible many combinations of the three lower motions. The table and core rod can be kept stationary if desired.

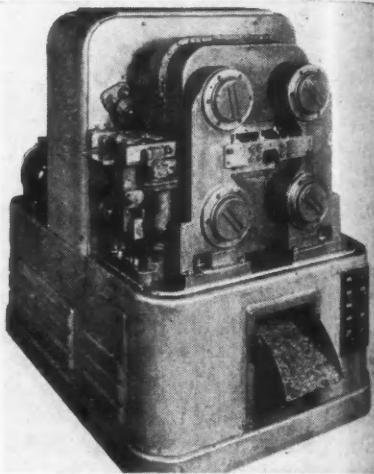
Specifications of the Bliss No. 309 briquetting press include: Capacity of slide, 345 tons; die table, 120 tons; core rod, 60 tons; stripper (eject up), 75 tons; stroke of slide, 10 in.; die table, 3 in.; core rod, 3 in.; stripper, 6 in. Strokes of the die table, core rod and stripper are adjustable.

## E-17—High Speed Punch Press

Lempco Products, Inc., Bedford, Ohio, has developed a new high speed punch press known as the Hypermatic. Speeds ranging up to 1800 strokes per minute, with stock accurately registered, are said to be commonplace, every day operations with the new press.

The Hypermatic employs the use of a rotary motion in actuating the dies. Four crankshafts are used; the upper two, rotating clockwise, drive the upper die head while the lower pair of crankshafts, counter-clockwise in motion, drive the lower die head.

The die members mounted in Lempco anti-friction die sets are located between the two die heads, the punch holder being fastened to the upper head and the die holder to the lower



Lempco Hypermatic punch press

die head. The punches and dies, therefore, have the same rotary motions as their respective die heads, closing and opening in each cycle of the crankshafts, giving the advantage of cutting the stock while it is actually in horizontal motion (cutting the stock as it goes by).

The stock is fed from right to left through friction feed rolls to and through a stripper plate which shuttles back and forth on a horizontal plane with no vertical movement whatsoever. Both the punch and die approach and recede from the stock, leaving it entirely free to move from one station to the next without interference.

No conventional flywheels are used in the Hypermatic. In effect, it uses a

## E-18—Gas Powered Fork Truck



This "Yardlift-20", a pneumatic tire'd, gas powered fork truck of 2000 lb. capacity, has been designed by Clark Tractor, Division of Clark Equipment Co., Battle Creek, Mich., for inter-plant movement of material over uneven ground. Its frame is suspended at the center of the pivoted steering axle, permitting the vehicle to conform to uneven surfaces. This is said to assure effective traction at all times, and prevent frame distortion and spring breakage.



## 75,000 Chemical Tests Every Month at Inland

Laboratory analysis...not guesswork...marks each stage in production of steel at Inland. The Inland chemical and testing laboratories work in closest liaison with the operating departments in maintaining rigid control over the chemical and mechanical properties of Inland steels. From raw materials to finished product, constant analyses keep check on every step in the processing of every heat.

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# NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 54

"flywheel die head" and, at each cut, the force required merely subtracts from the circular inertia of the heads and no perceptible shock load is received by the crank. The wear on the crankshafts is, therefore, negligible.

The crankshafts rotate in anti-friction bearings, under oil pressure, at both ends of the main housing and in the outer bearing brackets. They are driven through a transmission of herringbone gears, meshed twice horizontally and twice diagonally. This geared transmission is completely enclosed in the main housing and operates in an oil spray.

At the present time the Hypermatic press is being produced in a 10 ton and a 50 ton model.

## E-19—Device for Lead-Screw Threading

Greenlee Brothers & Co., Rockford, Ill., can furnish a new, improved arrangement for Greenlee six-spindle automatics to handle lead-screw threading. It eliminates many secondary operations and helps speed production on work pieces requiring threads with a very accurate lead.

The new threading arrangement is a combination cam-and-lead-screw-operated mechanism, and can be used in the third, fourth, and fifth positions. It is available for six-spindle machines of 1-in., 1 1/8-in., and 2-in. bar capacity.

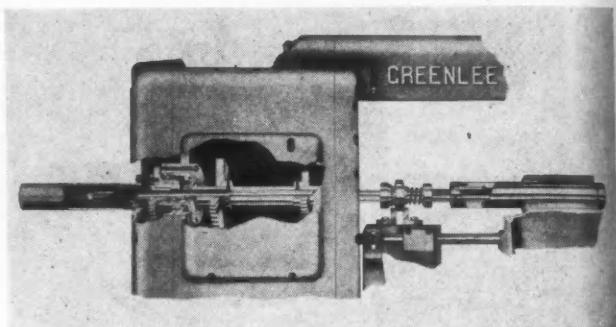
The arrangement incorporates a "relieved-type" lead-screw threading spindle, which is different in design and has several distinct advantages over earlier lead-screw equipment designed and built by Greenlee for their automatic screw machines.

The lead-screw attachment, itself, consists of a threading spindle unit, a removable 1 in. OD lead-screw and bronze nut, safety shear keys, an outboard bearing support, and a yoke to operate self-opening die heads. The threading spindle drive shaft is about 10 in. longer than the conventional drive shaft of threading attachments used on Greenlee automatics.

A relieved section on the threading spindle drive shaft, directly ahead of the removable lead screw, permits the use of the standard cam-operated lever to effect a quick-approach stroke and a rapid return. In this manner, production time is reduced. When threading a shoulder, or tapping a deep hole, at some distance from the end of the work piece, the quick-approach stroke saves additional time.

At the end of the quick-approach stroke, the lead screw on the end of the drive shaft threads itself into a bronze, lead-screw nut. This controls the threading-in and also the threading-out action of a tap or die head, insuring a clean, precision thread.

Greenlee threading attachment



At the end of the feed or threading-in stroke, the shifting of a duplex clutch changes the speed of the threading spindle. This causes the lead screw to thread itself out withdrawing the tool from the threads of the work piece. The standard, cam-operated feed lever then returns the threading

spindle quickly to starting position. The lead screw and nut is engaged only during the actual threading-in and threading-out operation.

This new Greenlee relieved-type lead-screw threading arrangement can also be set-up, without changing the threading drive spindle, to handle conventional, cam-operated, threading jobs. For ordinary work requiring class 1 or class 2 threads, it is only necessary to remove the lead screw and nut from the threading spindle drive shaft and adjust the standard threading box cams to meet stroke requirements. Thus, both types of threading jobs can be handled efficiently on a production basis without auxiliary equipment.

## E-20—Boom Attachment For Fork Trucks

A new interchangeable motorized slewing boom attachment for Automatic fork trucks just announced by Automatic Transportation Co., Chicago, makes a single fork truck quickly



Motorized slewing boom attachment mounted on an Automatic fork truck chassis

adaptable both for work usually requiring motorized slewing cranes and for that requiring standard fork-truck equipment.

The boom is designed for maximum versatility. It is manually adjustable in outreach from 54 1/4 in. to 108 1/4 in.; it is vertically adjustable from horizontal to an upward angle of 30 deg; and it swings horizontally 60 deg to either side of center. Mounted on a standard 6000-lb capacity Automatic fork truck chassis, the boom will handle 1100-lb loads at the maximum outreach and 1820 lb when in closed position. Maximum height of the hook is 18 ft 5 in.

Quickly detachable, the boom may be replaced by standard forks, gooseneck crane, motorized fork carriage, ram or any other similar attachments.

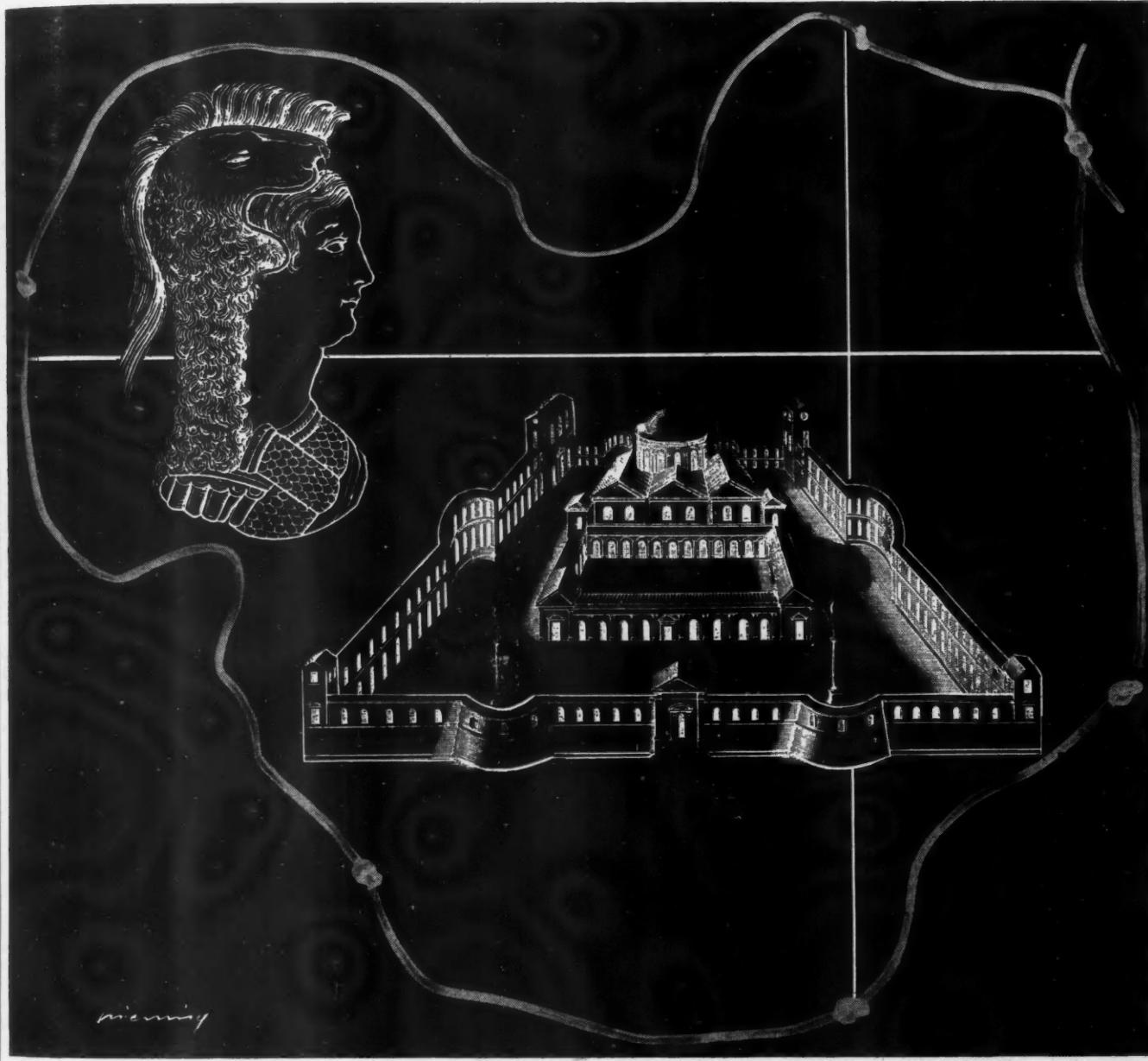
## A LITTLE DOES A LOT

According to legend, when the city of Carthage was founded, Queen Dido was told that she could have only as much land as could be encompassed by an ox hide. But the queen made the most of her material by cutting it into a single, continuous leathern string, with which she circled considerable acreage.

Making materials serve to the fullest is just as

important to users of steel today as it was to Dido. Except that today no tricks are necessary.

It can be done in many instances by specifying molybdenum steels. Their hardenability, freedom from temper brittleness and good strength-weight ratio help to simplify design problems and insure good performance. It will pay you to investigate their practical advantages.



MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"  
CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.

**Climax Molybdenum Company**  
500 Fifth Avenue • New York City

# NEW Production and Plant EQUIPMENT

For additional information regarding any of these items, please use coupon on page 54

## E-21—Vertical Milling Machine

The newly designed Type VMI vertical milling machine made by the Davis & Thompson Co., Milwaukee 14, Wis., has been adapted to the production milling of the two top pads on a clutch housing. Three spindles are provided for milling, two of which are mounted with interlocking cutters.

Cutter spindles are driven by 20-hp motor, worm and wheel and a gear train to furnish spindle speeds of from 82 to 328 rpm. Each cutter spindle has a micrometric vertical adjustment of  $1\frac{1}{4}$  in.

A two-station hand clamping fixture is mounted on a hydraulically driven indexing table. Location is taken from cored openings by universal pins on each end. In order to facilitate the indexing operation, the table is raised a few thousandths by means of a hydraulic cylinder. It is locked in place by this same hydraulic cylinder while the milling operation is taking place.

The milling head is mounted on a bed having hardened and ground steel ways. Movement of this head is actuated by a hydraulic cylinder.

The cycle of operation is fully automatic. The machine is placed in operation by pressing the starter button for the head drive and pump motors. After these motors have been placed in operation and a piece inserted into the fixture, the cycle start button is

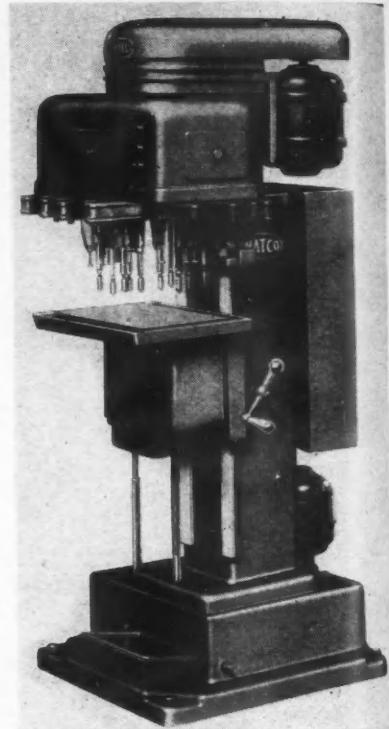
pressed. The table indexes to the working position, the milling head is rapid advanced to a predetermined position where limit switch is actuated. Contacting the limit switch changes the feed from rapid advance to cutting feed. Upon completion of the cut, another limit switch is actuated, stopping the feed and putting the head into rapid return until it reaches its original starting position.

During the time the machine has gone through its cycle of operation, another work piece has been placed in the second station of the fixture and the machine is ready to repeat its cycle.

## E-22—Drilling and Tapping Machines

The National Automatic Tool Co., Inc. of Richmond, Ind. has brought out a completely new line of small multi drilling and tapping machines. These new machines, Model A-33A and A-33B, incorporate simplified design and are said to speed production on light work of small holes where super sensitivity and high speed are of paramount importance.

The NATCO Model A-33A provides hand and foot feed or combination hand and foot and air oil feed. Model A-33B provides air feed. Spindle arrangement may be changed and reset to each particular job application. A large working table is provided. Spindle speeds



**NATCO A-33B multi drilling and tapping machine**

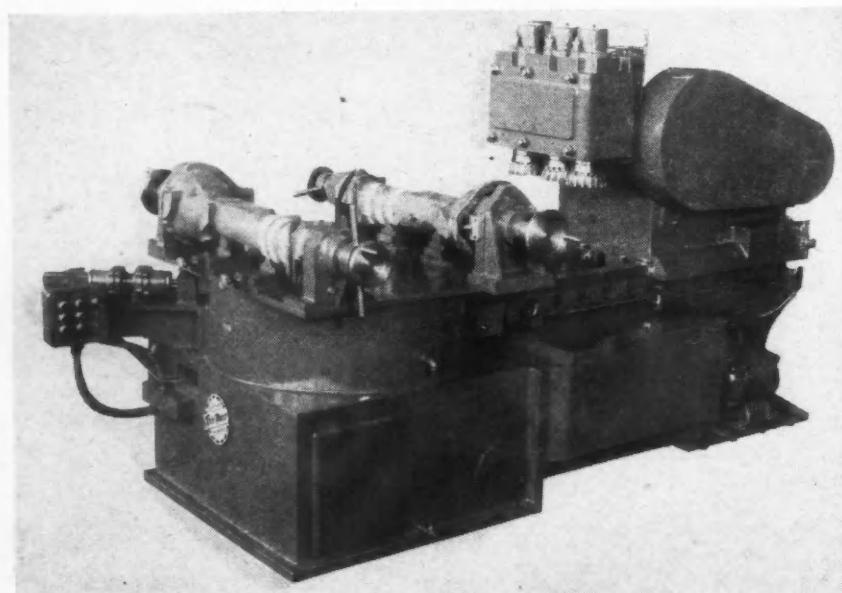
are changed by rearranging pulleys on the sheave at the top of the machine.

All electrical equipment is enclosed, protected against dirt and dust. Overload protection is also provided. NATCO A-33A hand and foot feed machine permits close control for sensitive operation and is equipped for both drilling and tapping. The head is bored for 10 spindles with spindle speed available from 650 to 350 rpm and sheave arrangement providing 10 speed variations. Motors are available for 110, 200 and 440 volts, 60 cycles, three-phase alternating current.

The NATCO A-33A is also provided with air oil feed in addition to combination hand and foot feed. This machine also can be arranged for both drilling and tapping. Head and spindle arrangement is the same as the other A-33A machine.

NATCO A-33B air feed machine is equipped with treadle control air feed table and the hand crank provides vertical table adjustment. NATCO A-33B air feed machine is especially suitable for light precision tapping. The feed of the table travels  $2\frac{1}{2}$  in. maximum amount as compared with 4 in. maximum feed on the A-33A combination machine. The head is bored for 10 spindles. Spindle speed is from 650 to 3550 rpm same as A-33A machines. This machine is available with coolant system, cluster plate, slip spindle plate and other equipment required. It is equipped with a one-hp motor same as A-33A machine.

Detail specifications are as follows for both A-33A and A-33B machines: Height of machine is 70 in.; center of head to face of column is  $5\frac{1}{4}$  in.; floor



**Davis & Thompson Type VMI vertical milling machine**

# JUST WHAT THE DOCTOR ORDERED.....



## ... for All Assemblies!

FORM-A-GASKET No. 1 (a paste) sets fast . . . but not too fast for use on large surfaces. It dries hard, but does not become brittle. It's a swell product for making pressure-tight, leak-proof unions . . . even if surfaces are warped.

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AVIATION FORM-A-GASKET No. 3 (a brushable, self-leveling liquid) sets into position and dries to a tacky paste. It will not run, even when heated to 400° F. nor become hard or brittle at temperatures down to 70° F. below!

ALL TYPES OF FORM-A-GASKET PRESERVE ALL TYPES OF GASKETS!

**PERMATEX COMPANY, INC., BROOKLYN 29, N. Y.**

# NEW Production and Plant EQUIPMENT

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to top of table, maximum, stroke up 41 1/2 in.; floor to top of table, maximum, stroke down 29 in.; feed travel of table, A-33A, hand and foot feed machine and A-33B air feed machine, maximum, 2 1/2 in.; feed travel of table, A-33A, air oil feed combination machine 4 in.; maximum distance top of table to head flange, 22 in. Drilling area of head 5 1/4 in. by 9 3/4 in.; working surface of table 9 in. by 12 in.

## E-23—Large Pivoted-Blade Shear

A large shear employing the pivoted-blade principle of operation was recently completed by the Cleveland Crane and Engineering Co. of Wickliffe, Ohio.

Capable of cutting 12 ft of 3/4-in. steel plate, at 30 strokes per minute, the machine has an extra deep 36-in. throat, which permits slitting of very wide plate.

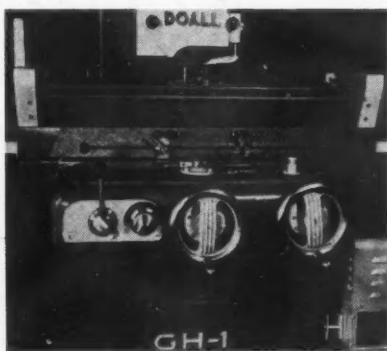
The knife clearance may be varied to suit the thickness of plate being cut. Turning a hand crank, located on the right end housing, changes the gap between the knives. A large dial indicator indicates the clearance in thousandths of an in. and also shows the plate thickness that may be cut for any knife setting.

The machine is electrically operated by a foot switch which can be moved about the floor to the best working

position. A back-gage which floats on ball bearings is adjusted by a crank placed at the right end near the bed of the machine.

## E-24—Improved Surface Grinder

In designing its new Model GH-1 "Handraulic" surface grinder, the DoALL Co., Des Plaines, Ill., has combined the finger tip control of the conventional hand operated grinder with



**Handraulic surface grinder**

the automatic power feeds found in hydraulically powered machines.

Instead of a handwheel connected to the table by rack and pinion, there is, in the "Handraulic", a direct coupled

hydraulic cylinder to power the table movement. Starting, stopping, and reversing of the table are controlled by a self-centering, four-way valve. The valve is operated by a six-in. hand lever with a ball handle. When the lever is pushed in the desired direction the table starts instantly and moves at a uniform speed. To stop the table, the operator releases the handle which automatically returns to neutral, instantly stopping the table. Through a valve located next to the directional control lever, table speeds infinitely variable from five to 50 fpm are obtained.

The table is equipped with new-type combination trip dogs to regulate length of table travel. These trip dogs can be set to stop the table either automatically by returning the control lever to neutral or instantly at a predetermined point regardless of the position of the lever.

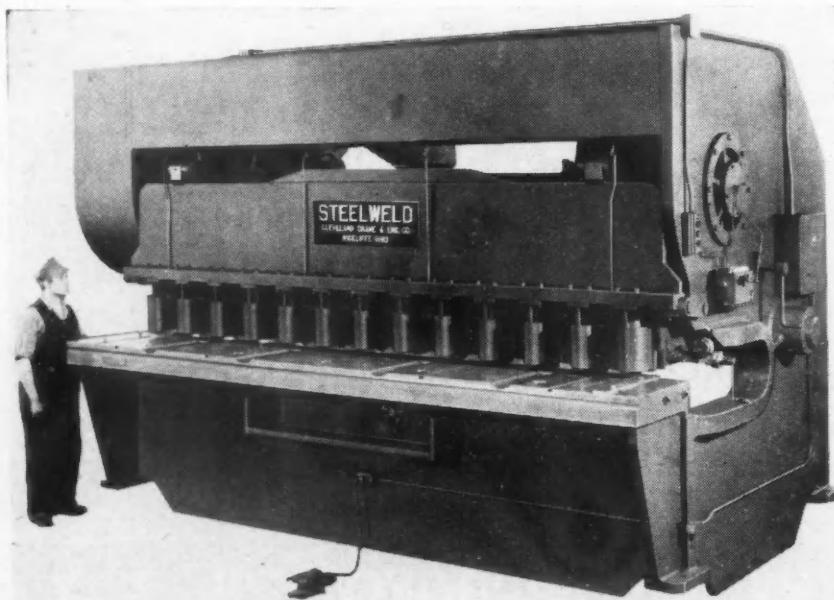
The manually operated 1 in. cross-feed screw is located in the center between the cross ways. It operates in a large bronze nut and its thrust is taken by double pre-loaded Timken taper bearings. The cross-feed handwheel is graduated in increments of .001 in. With the built-in vernier, settings to .0001 in. are possible.

## E-25—Steel Grid Conveyor Belt

A steel grid conveyor belt that can turn corners without tipping—describe a complete circle if necessary—move a product uphill or down, or horizontally straight ahead has been designed for industrial process lines with special space requirements. Known as "Flex-Grid," this wire-built belt is manufactured by Cyclone Fence Division of American Steel & Wire Co., United States Steel Corp. subsidiary, in Waukegan, Ill. Its open construction permits the air circulation required for cooling a light-weight product while in motion. A section 2 ft wide weighs only 3 lb per linear ft and is made in bright, galvanized, tinned or stainless steel wire as may be most desirable to meet special conditions in manufacturing operations. There are no lubrication problems, and because steel wire is used, no difficulties result from oils, greases, fumes, or heat.

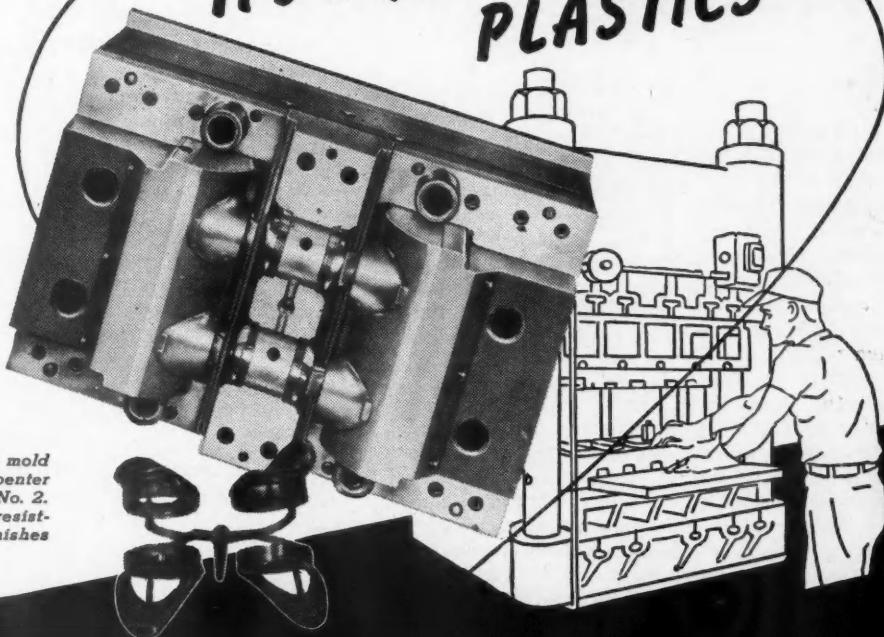
Necessarily, Flex-Grid belts must be assembled to meet the needs of the individual user's design, taking into consideration such problems as service life, speed of transfer, weight, power required to operate, and slippage. As the belt is assembled from individual straight, stiff wires, it is possible to compensate wear factors by replacing one or more links at a time.

The belt is made from No. 9 gage steel wire assembled on 1/2-in. centers and is available in standard widths, from 6 in. to 2 ft, in straight lengths or curved sections. Normal construction involves length up to 40 ft.



**Shear built by the Cleveland Crane and Engineering Co.**

*It's happening in  
PLASTICS*



*Plastic goggle frame mold  
and force made of Carpenter  
Stainless Mold Steel No. 2.  
It provides corrosion resistance  
and perfect finishes  
over long runs.*

## *Because Carpenter Helped to Cut Costs with Stainless Steel*

One of the important jobs being done by Stainless Steel is the protecting of highly polished plastics mold cavities against corrosion.

Some plastics are highly corrosive, could quickly ruin the mirror-like surface of a mold. Then too, the high cost of chrome plating is eliminated where Carpenter Stainless is used.

On your own jobs, you can put the corrosion resistance and high physicals of

Carpenter Stainless to work...and you can do it at a saving. Ever since the days when Stainless was first developed, we at Carpenter have been looking for—and constantly finding—new ways to help cut costs where it is used. Put our "know how" to work on your Stainless problems. Get in touch with your nearby Carpenter representative and ask for a copy of the 97-page book, "Working Data for Carpenter Stainless Steels". It will help you get the most from every pound of Stainless you use.

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# PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of **AUTOMOTIVE INDUSTRIES**. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

## D-15—Broaches

Connecticut Broad & Machine Co.—A brochure entitled, *Better Broach It!* A short introductory story of the company and its products is given, followed by a section consisting of ten case studies of actual broaching operations. Each case study is a folded 4-page form which includes a designation and photograph of the broached part, a photograph of the broach (or broaches) used and a full description of the part, material broached, operation and the broach itself. The center spread contains a complete engineering drawing of the broach and part in blueprint reproduction. In addition, the following topics are discussed: What can be broached—and limitations; length of broaches; care of broaches—sharpening, lubrication, storing, etc. Inside the back cover is an envelope containing a 12-page book of the latest engineering data of broaching standards, in table form.

## D-16—Profilometers

Physicists Research Co.—6-page illustrated bulletin on surface roughness measurement and its relationship to production and quality control. It also explains how the Profilometer is used

1) to obtain a positive check on roughness specifications in definite microinch units over any desired length of surface; 2) to shorten or eliminate production operations; 3) to detect impending dimensional errors before they occur; 4) to permit more accurate dimensional control, and 5) to obtain a more consistent finish from cutting tools. Numerous photographs show the Profilometer in use.

## D-17—Fiberglas

Owens-Corning Fiberglas Corp.—A 12-page booklet, *The Case of Material X*, describes Fiberglas materials used for plastic reinforcements, properties imparted to plastics by these materials and newly-developed processes for volume production of Fiberglas-reinforced plastics products. The booklet is illustrated with numerous photographs, including several of end-use Fiberglas-reinforced plastics products such as automotive body and aircraft parts, etc.

## D-18—Multi-Spindle and Nut Tapping Machines

The Bodine Corp.—8-page bulletin covers automatic dial feed multi-spindle machines and automatic 4-spindle nut tapping machines. Each model type is

illustrated and described and specifications are included. The section devoted to the nut tapping machine describes special jobs performed on the machine and includes sectional drawings and specifications.

## D-19—Tube Fabricating Equipment

The Parker Appliance Co.—Newly issued catalog describes Parker production tube bender and accessories, hand benders, cutters, flaring tools, beading kit and tube fabricating service. Helpful operational information and pictures illustrating tools in use are included.

## D-20—Punches and Dies

Allied Products Corp., Richard Brothers Div.—New Booklet, *Punch Pointers*, gives do's and don'ts that have an important bearing on proper punch press set-up and operation and the proper care and use of R-B Interchange Punches and Dies. The booklet is illustrated in cartoon style and the text is brief and easily understood.

## D-21—Floating Disc Clutches

The Carlyle Johnson Machine Co.—A new booklet on the Maxitorq floating disc clutch gives design principles and lists important features. The three basic types are illustrated and described and special applications are given. Specifications for the various types of clutches are included, together with engineering drawings of the clutches, repair price list, typical installations, etc.

(Turn to page 68, please)

**TIME SAVER COUPON** for your convenience in obtaining, **WITHOUT OBLIGATION**, more information on any one or more of the publications described above OR new Production and Plant Equipment OR New Products items described on following pages.

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Chestnut & 56th Sts., Philadelphia 39, Pa.**

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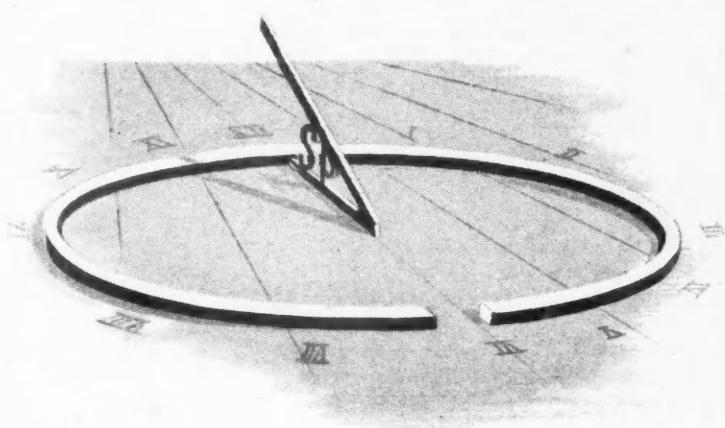
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**SEALED POWER PISTON RINGS**  
PISTONS • CYLINDER SLEEVES

# NEW Products

For additional information regarding any of these items, please use coupons on page 54

## F-10—Lightweight Foamed Plastic

The foamed "lighter than cork" plastic developed recently by the Du Pont Co. and tentatively called CCA, the initials of its chemical designation, cellular cellulose acetate, has been given the trade-mark "Strux."

"Strux" is a core material for laminations with metal, wood and plastic skins. In laminations, the material imparts great strength with extremely light weight. It is also a good insulator against heat and noise.

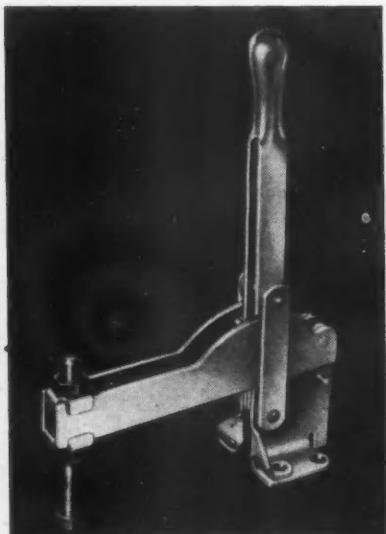
Still being produced on a limited basis, "Strux" has already been successfully adapted in aircraft wings, panels and stabilizers, boats, and refrigerators.

Among the uses forecast for the plastic are in railroad cars, refrigerator trucks and trailers, and rigid insulation.

## F-11—Heavy Toggle-Action Clamp

A heavy, toggle-action clamp called the Jumbo has been brought out by Knu-Vise, Inc., Detroit, Mich. With normal pressure on the handle it is capable of exerting a pressure of 1350 lb at the extreme end of the toggle bar.

By virtue of the design of the base,



*Jumbo Clamp*

comprising an integral front bracket and a back support, the deflection at the spindle is not more than 3/16 in. It is said to be the only big clamp which per-

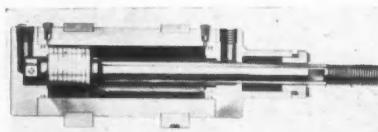
mits spindle to be adjusted longitudinally along toggle bar to accommodate various placements of work at pressure point without the necessity of changing original location of clamp.

The clamp is supplied with a complete spindle assembly, but this can be removed and replaced by any special pressure pad to meet the user's particular requirements.

In upright position, this clamp, catalogued as V-1100, measures 14 1/4 in. in height, with overall length of 9 1/2 in., and weighs 6 lb.

## F-12—New Line of Hydraulic Cylinders

The Hydro-Line Manufacturing Co., Rockford, Ill., is producing a new line of standard hydraulic cylinders. The body of these cylinders is centrifugally cast semi-steel with a tensile strength



*Cut-away view of Hydro-Line cylinder*

of 40-55,000 lb. The cylinders are bored and honed and the standard line includes all conventional types of mounting. The piston is of cast iron fitted with four automotive type rings, and the piston rod is polished and ground.

The standard construction includes a 1/2 in. cushion at each end. Sea ring packing with three rings plus the header and follower are incorporated in the design. The cylinders also have an "O" ring at each end. They are rated at 1,500 psi capacity. The standard line ranges from 1 1/2 in. through 8 in. bore with stroke to suit.

## F-13—High Strength Welding Electrode

The new and improved Wilson No. 524 all position electrode was developed by the Wilson Welder and Metals Co., Inc., 60 E. 42nd St., New York 17, N. Y., primarily for use by the aircraft industry in welding assemblies such as landing gear, engine mounts and other vital parts where great strength gained by heat treating after welding is desired. Although primarily designed for

the aircraft industry, this electrode can also be used on alloy steels where high tensile strengths are required.

The improved Wilson No. 524 electrode has an advantage over its predecessor in that the necessity for pre-heating is minimized when welding high strength chrome-moly aircraft steels. It is said that weld deposits made with this electrode are not susceptible to cracking even when pre-heating is not employed, since the weld metal is more ductile. Tensile strengths up to approximately 150,000 psi can be obtained when the deposited metal is heated to 1600 F, quenched in oil and drawn at 600 F for one hour.

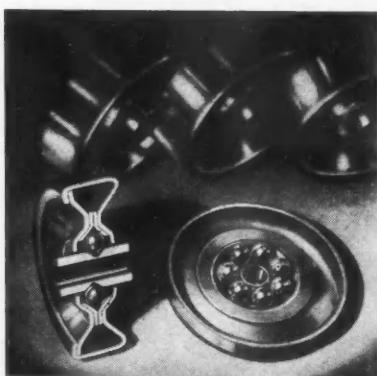
## F-14—Superfine Glass Fiber Material

A Fiberglas superfine fiber material, for use as filler for aircraft, motor coach and automobile seat and seat-back cushions, is announced by Owens-Corning Fiberglas Corp., Toledo, Ohio.

The superfine glass fibers are said to provide a low-cost, light-weight, non-combustible, resilient filler with excellent over-all riding qualities. In a typical aircraft installation, use of the Fiberglas fibers in seat and seat-back cushions has resulted in a weight-saving of 2 lb per seat.

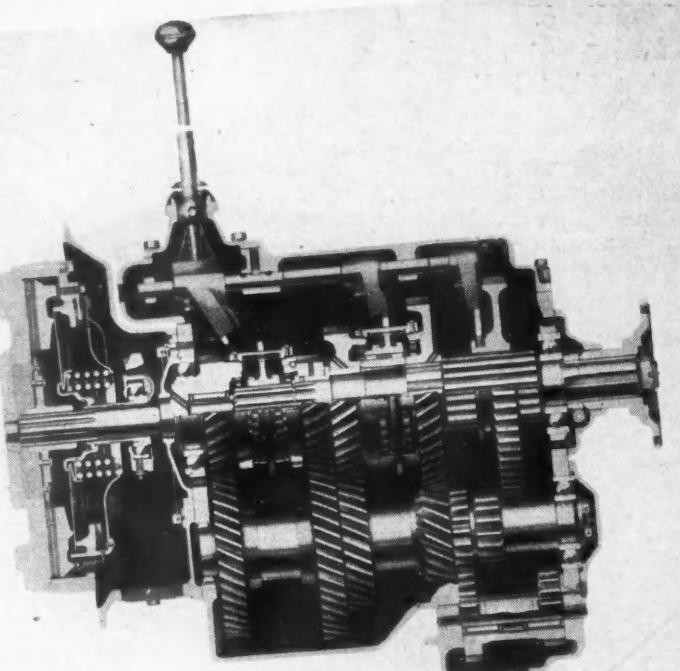
Identified as Fiberglas Superfine PF, Type A44, the individual fibers have an average diameter of 11 one-hundred-thousandths (0.00011) in. In order to provide dimensional stability and handleability, the fibers are treated with a resin binder and formed into blankets of 0.5 lb density, one in. thick.

## F-15—Ball Bearing Steel Wheels



The George K. Garrett Co., 1421 Chestnut St., Philadelphia 2, Pa., is introducing these new "Finely Balanced" ball bearing wheels for use on many types of products, such as conveyors, etc. The wheels are two in. in diameter and are made of heavy gage selected steel. The bearing races are heat treated for long life. Each wheel contains seven 1/4-in. balls.

Garrett "Finely Balanced" wheels are made to fit standard axles (1/4-in. bolts).



• Built by SPICER MFG.  
DIVISION OF DANA CORP.

**SKF**  
Puts the  
**RIGHT BEARING**  
in the  
**RIGHT PLACE**

## A NEW HEAVY DUTY TRANSMISSION

This new Spicer "Brown-Lipe" heavy duty synchro-mesh transmission is a credit to Spicer's skill as a builder. For in its design, Spicer engineers included elements to give satisfaction and build good will . . . elements that, besides giving service, help to sell this unit and keep it sold. They protected main shaft and countershaft locations with **SKF** Ball Bearings. These bearings rotate smoothly and quietly, maintain the original setting of the gears, and show practically no wear throughout a long life. In the selection of this transmission for your heavy duty trucks, you will also use good judgment.

6277

**SKF** INDUSTRIES, INC., PHILADELPHIA 32, PA.

# NEW Products for AIRCRAFT

for additional information regarding any of these items, please use coupon on page 54

## F-16—Speed Density Carburetion System

An entirely new approach to the problem of aircraft engine fuel feed is presented in the Stromberg Speed Density carburetion system, a recent development of Bendix Products Division, Bendix Aviation Corp., South Bend 20, Ind., which meters fuel in response to variation in engine rpm, intake manifold pressure, intake manifold temperature and exhaust back pressure, rather than variations in mass air flow through a fixed venturi as used in the conventional carburetor. These new values governing fuel feed as presented in the Speed Density system may be read while the airplane is in flight or the engine is operated on a test stand, and carburetor settings can be determined and constantly checked during the flight.

The principal elements of this new system consist of a vane-type, engine-driven fuel pump; centrifugal pressure regulator with a temperature unit and pressure-responsive bellows assembly; accelerating pump; water regulator; and fuel discharge nozzle assembly. Recognizing that the air flow to an internal combustion engine is affected by the rpm and manifold pressure, the Stromberg Speed Density System operates with a variable metering orifice controlled by the manifold pressure while the metering head across this variable fuel orifice is controlled by engine rpm.

Advantages claimed by the manufacturer are said to include: A gain in power at critical altitudes provided

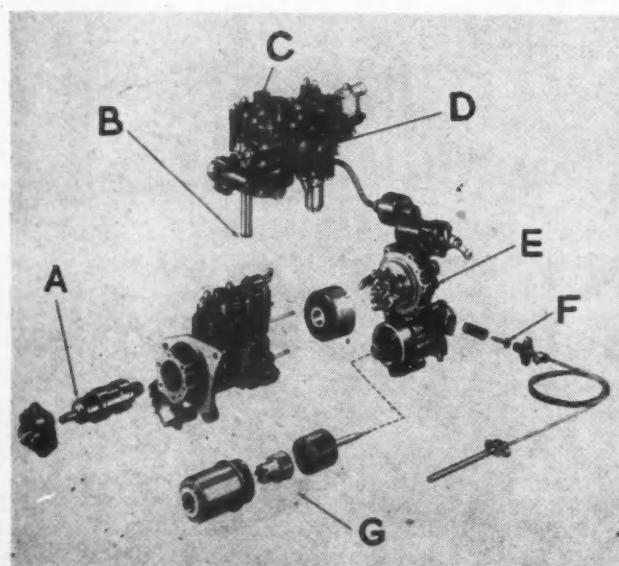
that an efficient air intake is used because the throttle valve is the only air flow restriction; a fundamental advantage over the air flow system in that the metering head is not limited by the venturi suction available; and metering over the entire operating range for, like the Stromberg injection carburetor, it does not require a separate idling system such as was used in the conventional float type carburetor.

The Stromberg Speed Density fuel metering system may be used to control fuel metering with direct or timed injection of fuel on reciprocating engines ranging in size from the 60 hp aircraft engine to the largest built.

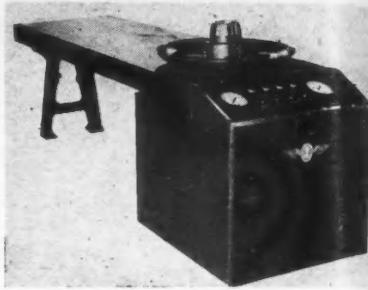
Modification is said to permit special advantages on jet propulsion and gas turbine engine controls.

## F-17—Propeller Test Machine

Greer Hydraulics, Inc., 454 18th St., Brooklyn 15, N. Y., has brought out a machine for testing the various models of Hydromatic propellers and distributor valves in current use. Known as the Model GT-185, the complete device consists of an assembly and test table, and a completely self-contained power unit. Inlet, outlet, and drain oil connections are provided for attachment of the suction, pressure, and drain lines from the power unit to the test table. All components of the power unit are housed within an all-steel cabinet. The power unit is mounted on four rubber-tired casters, two of which swivel to facilitate mov-



Units of the Stromberg Speed-Density carburetion system in an exploded view to show their relation: (A) Vane-type engine-driven fuel pump. (B) Fuel discharge nozzle. (C) Accelerating pump. (D) Water regulator. (E) Centrifugal pressure regulator. (F) Temperature unit. (G) Pressure responsive bellows assembly.



Greer Model GT-185 test machine

ing the unit. The instrument panel is conveniently located to provide instant visibility and ready accessibility to valves, connections, gauges, etc. Some of the features are: Ample power to handle latest type propeller domes; solenoid operated shut-off valves; positive action controls permitting no lost motion; and portable power unit which may be used for numerous operations.

## F-18—All-Weather Approach Light System

An airport approach lighting system designed to penetrate 1000 ft of the thickest fog has been developed by the Westinghouse Electric Corp. The new lighting system supplements but does

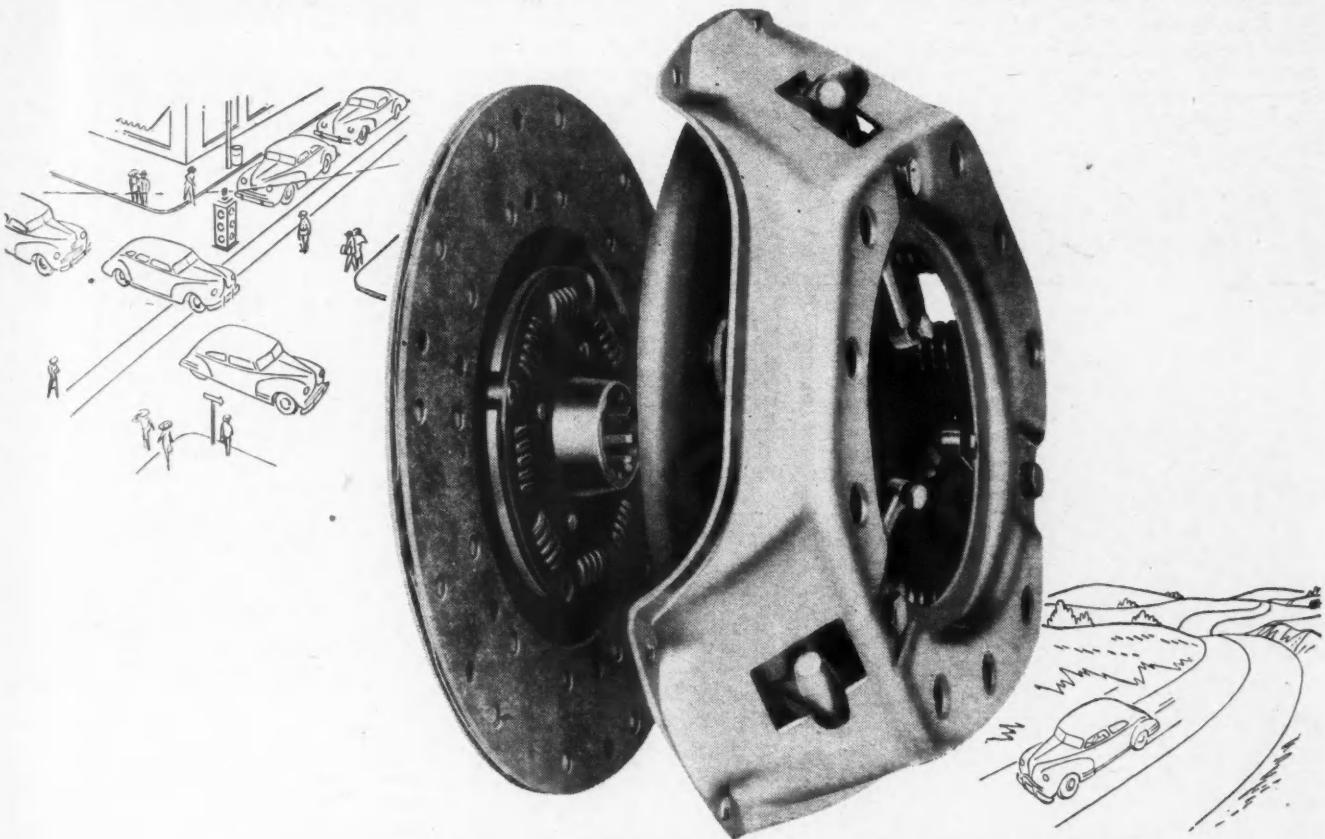


Westinghouse krypton light

not replace radio and radar aids. The pilot will continue to locate the airport by radio and align his plane by instruments at the outer marker—a point two miles from the end of the runway. There he begins to descend slowly until he reaches the approach portal, an imaginary frame 400 ft high and 700 ft wide with its lower edge 100 ft above the level of the runway surface. Here he receives a radio signal indicating that he must leave instruments and search for visual contact. Once the plane enters the approach portal, 3500 ft from the end of the runway, the pilot will be able to see the artificial lightning flash produced by the line of brilliant approach lights, regardless of weather conditions.

The all-weather approach light system includes three component parts: (Turn to page 78, please)

# On CITY STREET



## ... or OPEN ROAD

LONG Clutches have Smooth,  
Easy, Positive Operation

Stop-and-go traffic drivers appreciate the combination of easy operation and positive dependability of the Long clutch. And, on the highway, Long's semi-centrifugal clutch construction gives greater torque capacity at increased speeds. This means less slippage and wear, and longer service. Since 1922, millions of cars, trucks, buses and tractors have been equipped with the Long clutch.

LONG MANUFACTURING DIVISION  
BORG-WARNER CORPORATION  
Detroit 12, and Windsor, Ontario



**LONG**  
CLUTCHES • RADIATORS • OIL COOLERS

## Convair's Master Building Plan

(Continued from page 31)

splice casting on the wing center section fixtures. This plate, like that used for the center section, performs the same function of drilling and reaming. Located on the outboard end of the outer panel assembly fixture is a hinge plate for locating and drilling the wing tip attach fittings. Thus interchangeability is insured for the wing tip, as this plate is drilled from the same master gage used in manufacturing the wing tip assembly fixture.

Aileron-hinge bracket attach holes are drilled in the rear spar by hinge drill plates which actuate from the upper horizontal 10-in. pipe. After these holes are drilled, the aileron hinges are installed on the outer panel, located from the hinge bushings. This insures interchangeability of hinge points.

6. VERTICAL STABILIZER FIXTURE—The fixture for assembling the vertical stabilizer is of the picture-frame type

manufactured from six-in. diameter pipe. At one end, dummy fittings that simulate the attach fittings on the bulkheads insure interchangeability. These fittings are located with a master plate used to position the locators in the tail fixture. Retractable arms which hinge from the upper horizontal pipe drill holes for the rudder hinge on the rear spar. Interchangeability of these hinge points is positive, as they are set by a master gage used to manufacture hinge sub-assemblies.

7. HORIZONTAL STABILIZER FIXTURE—The same type of fixture is employed to form the horizontal stabilizer as that used in building the vertical stabilizer, except that elevator hinge attach holes are drilled instead of the rudder hinge attach holes.

8. RUDDER FIXTURE—Six-in. and eight-in. diameter pipe are used in constructing the picture-frame type rudder assembly fixture. Locators position hinge points, spars, and a number of trailing edge ribs. The leading edge and main spar are installed as a sub-assembly; thus no locators are necessary for leading edge ribs. Several of the trailing edge ribs are located by the aft tooling hole but the majority of them are self-locating. Retractable locators likewise position the closing spar, tab hinge points, and the trailing edge struts.

9. ELEVATOR FIXTURE—The fixture for assembling the elevators is the same type of construction as that used in assembling the rudder. Technique in the assembly of the elevators generally is similar to that used in assembling the rudder, except for hinge and rib locating and positioning of the ribs.

10. DORSAL FIN FIXTURE—Assembly fixture for the dorsal fin is manufactured from six-in. diameter pipe and is of a straight pipe with T-leg attachment construction. It is used to locate the sub-assemblies and the ribs in their proper relationship; it also locates the fittings that attach the dorsal fin to the vertical stabilizer front spar. The skin is trimmed properly by means of skin stops.

11. FLAP FIXTURE—The picture-frame type fixture for assembling flaps is manufactured from three and four-in. diameter pipe. It is equipped with hinge point and spar locators. Trailing edge ribs are located by the aft tooling hole. No locator is required for the forward end of the trailing edge rib, since it is nested in the spar. Retractable locators at the aft tooling hole allow complete skinning of the assembly in the fixture, so that the hinge points can be controlled during the skinning operation.

12. AILERON FIXTURE—Three and four-in. diameter pipe is used to build the aileron assembly fixture, of straight pipe with T-leg construction and formed from three and four-inch diameter pipe. Locators for the hinge points are the only ones necessary to position the

(Turn to page 62, please)



Thousands of leading engineering, production and purchasing men know Grizzly as a dependable supply source for fine quality brake lining.

Engineering men recognize the "know-how" resulting from Grizzly's thirty years of engineering development and

research. Production men acknowledge that Grizzly plants are ably manned and employ the most modern mass production techniques. Purchasing men know Grizzly as a reliable source for fine quality brake lining in the competitive price range.

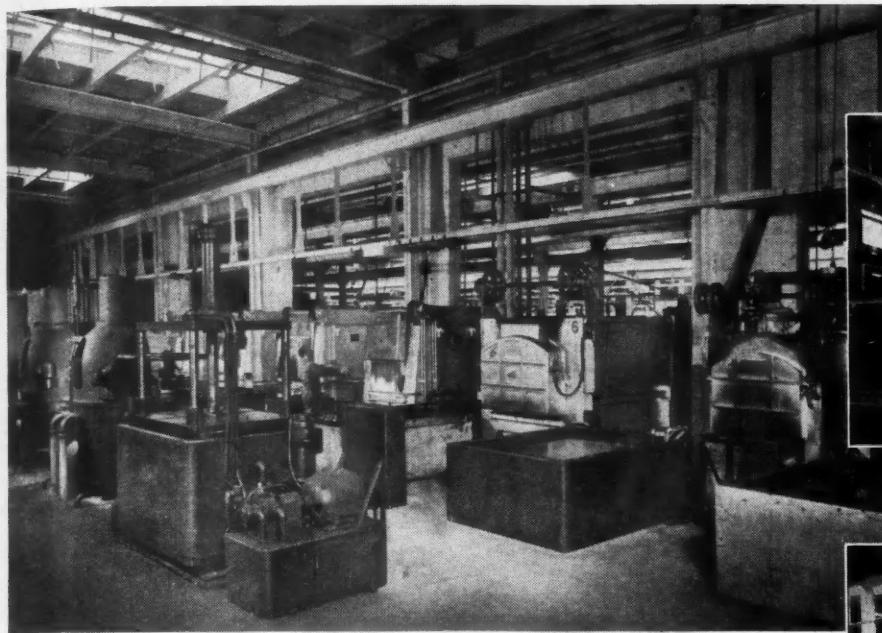


**GRIZZLY MANUFACTURING COMPANY**  
PAULDING, OHIO

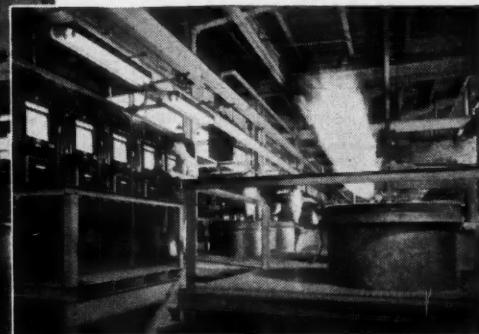
PLANTS AT PAULDING AND BELL, CALIF.

Warehouse Stocks in Principal Cities

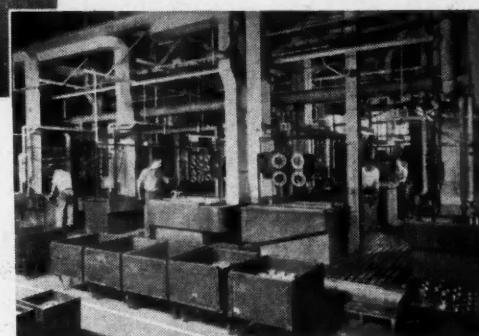
# FACILITIES TO PRODUCE THE *Gears* YOU NEED



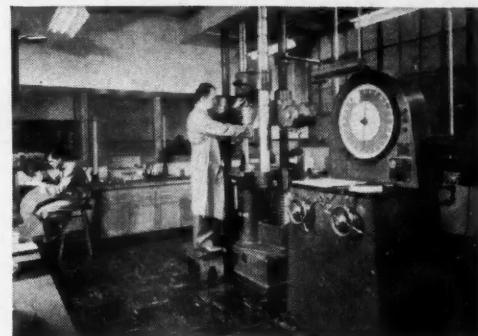
Controlled atmosphere furnaces,  
quenching presses in the foreground



Carburizing and nitriding furnaces



Section of plating department



Physical testing laboratory to  
provide control of heat treating

## ... take heat treating for example

If you use gears—spur—helical—worm or bevel—Foote Bros. can fill your needs. In two large plants, you will find the latest in modern machinery backed by nearly a century of manufacturing skill to produce gears for practically every requirement. Giant gears 20 feet in diameter for cement kiln or sugar mill drives. Extremely high precision gears for aircraft engines. Industrial gears for gas or diesel engines, tractor transmissions, mining and construction machinery, machine tools or any industrial application.

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- BULLETIN "FOOTE BROS. POWER UNITS"

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# Convair's Master Building Plan

(Continued from page 60)

leading edge sub-assembly, as the hinge points are attached to it. Each trailing edge rib is located from its aft tooling hole by a retractable locator. Also positioned by retractable locators are the closing spar and trailing edge. The part is skinned in this fixture so that the hinge points can be held to insure their interchangeability.

13. WING CENTER SECTION LEADING EDGE FIXTURE—Vertical fixtures used in assembling wing center section leading

edges are formed from four to six-in. diameter pipe and are mounted at a 15 deg angle. At each station, a Masonite former positions the rib by means of tooling holes. Tooling holes are also used to locate the part when formed, and to insure a smooth surface during assembly. Locators for the wing attach strips make certain that the leading edge attachment extrusion matches the knob on the spar rails.

14. WING CENTER SECTION TRAILING

EDGE FIXTURE—Horizontal and vertical picture-frame type fixtures for assembling the wing center section trailing edge are constructed from four to six-in. diameter pipe. Each rib is provided with five locators: two pick up tooling holes and three clamp the rib in plane. Trailing edge attach strips are also located in this fixture by nest pins. Locators for the flap tracks provide correct alignment. The fixture also positions the applied drill plates used to drill the access doors' attach holes; the holes are interchangeable from the openings to the doors.

15. WING OUTER PANEL LEADING EDGE FIXTURE—The fixture for assembling wing outer panel leading edges is similar in construction to that used for assembling wing center section leading edges.

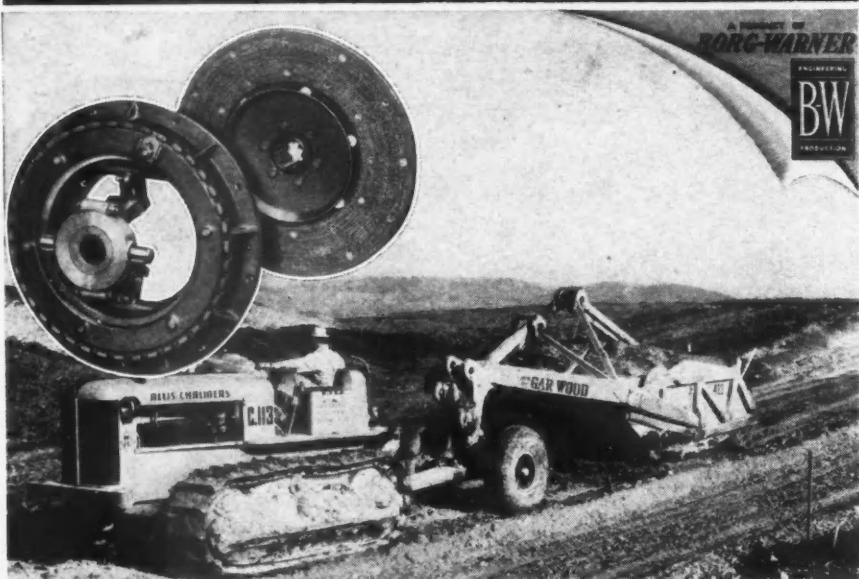
16. WING OUTER PANEL TRAILING EDGE FIXTURE—Of single pipe T-leg construction, the fixture for assembling the wing outer panel trailing edge is manufactured from six-in. diameter pipe. Masonite formers are provided for locating the ribs. Each former is equipped with four locators, two for tooling holes and two as pads for clamping the rib in plane. Several of these formers are cut to mold line and simulate the aileron hinge ribs since these ribs are installed into the outer panel before the assembly takes its place on the airplane. Applied drill plates for access door openings are used in the same manner as those employed for the wing center section fixtures. Locators for the skins and the attaching strips also are provided.

17. NACELLE FIXTURE, AFT OF FIREWALL—The upper nacelle assembly fixture of three and four-in. diameter pipe construction, is manufactured in a vertical position to allow free accessibility to employees as they work on the aft portion of the assembly. Formers locate each beltframe as well as the longerons, which hold engine mount attach fittings. Fixture for assembling the lower nacelle is of three-in. diameter pipe, of the straight T-leg type construction. Locators position the ribs, skin, and longerons; retractable locators position and drill hinge points. The fixture for assembling the side nacelle is of the two-plane table-type with T-leg construction, made of three and four-in. diameter pipe. It locates sub-assemblies and longerons and is provided with skin-strip clamps which hold the skin to proper contour while rivet holes are drilled.

18. COWLING FIXTURE—Fixtures used by a sub-contractor in assembling each section of the "orange-peel" cowls are of the picture-frame trunnion type, constructed from four-in. diameter pipe. Mounted in each picture frame are two dural plates drilled from master gages to insure interchangeability of shear pins and bushings. Following assembly of each "orange peel," the "peels" are mated on the assembly plate which lo-

(Turn to page 64, please)

# ROCKFORD



## OVER-CENTER CLUTCHES

EASY OPERATION

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POSITIVE ENGAGEMENT

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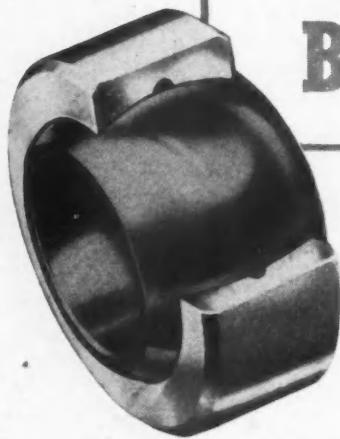
This 100-ton single point model is one of a number of Danly Presses built in sizes ranging from 100 tons up. Special sizes and adaptations engineered to customer specifications.

THE NEW

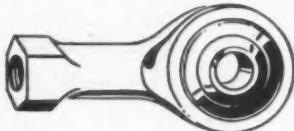
# HALFCO

## SPHERICAL CONTACT SELF-ALIGNING BEARING

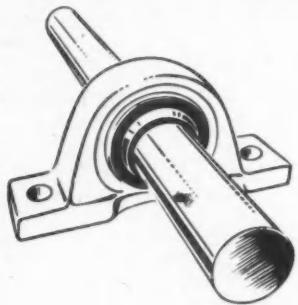
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The extremely high permissible loading on the HALFCO Bearings makes them well suited for static, self-aligning bushing service. HALFCO units are also used as engine mount attachment bushings where heavy loading and easy removal of supported unit are important.

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## Convair's Master Plan

(Continued from page 62)

cates each assembly from its respective hinges. At this point the assemblies are checked to make certain the shear pins function properly.

ASSEMBLY LINE TECHNIQUES — Following the assembly of the fuselage and the center wing section, a crane carries both components from their fixtures to Station 1 on the assembly line. The wing center section is positioned first and the fuselage is then lowered and mated to the center section, the first of numerous assembly-line processes leading to completion of the airplane.

These processes, station by station, include:

Station 1—Mating of fuselage and center wing section; installation of horizontal and vertical stabilizers, dorsal fin, and rudder.

Station 2—Mating clean-up; installation of stub leading edges and center section trailing edges, outer wing panels, and engines.

Station 3—Installation of cabin pressure sealing; installation of wing-to-fuselage fairing; completion of all control pressure joints; installation of tubing, control cables, and electrical hook-ups; final fitting of escape hatches and doors.

Station 4—Cabin pressure tests; installation of flaps; completion and inspection of all wing items.

Station 5 — Installation of landing gear; rigging of cable controls; completion of electrical and hydraulic hook-ups; painting of wing numbers and insignia.

Station 6 — Final inspection and clean-up of control system; final inspection and clean-up of electrical system.

Station 7 — Final inspection and clean-up of hydraulic, landing gear, and flap systems.

Station 8 — Final cabin pressure tests, using plane's own equipment; painting of fuselage, insignia, landing gear, etc.; final inspection and clean-up of basic airplane.

Station 9—Installation of flooring and partitions; installation of sound-proofing.

Station 10 — Completion of sound-proofing and installation of upholstery. Station 11—Completion of interior; installation of seats and carpet; installation of propellers.

Station 12 — Final inspection and clean-up of interior; installation of special equipment.

By this time, the finished airplane, having reached the end of the assembly line, is ready for engine, ground, and flight testing, and ultimate delivery to the customer.

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Parts made from HYCAR synthetic rubber have 50% greater abrasion resistance than parts made from natural rubber. That means they'll last longer, give more dependable performance in the most severe service, and save maintenance and replacement time.

But that's only one of HYCAR's unusual and valuable properties. Examine the list in the box at the right. Think of these properties in terms of your requirements of rubber parts. Realize that these properties may be had in an almost limitless number of combinations, each designed to meet the specific service conditions of the finished part.

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1. EXTREME OIL RESISTANCE — insuring dimensional stability of parts.
2. HIGH TEMPERATURE RESISTANCE — up to 250° F. dry heat; up to 300° F. hot oil.
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4. MINIMUM COLD FLOW — even at elevated temperatures.
5. LOW TEMPERATURE FLEXIBILITY — down to -65° F.
6. LIGHT WEIGHT — 15% to 25% lighter than many other synthetic rubbers.
7. AGE RESISTANCE — exceptionally resistant to checking or cracking from oxidation.
8. HARDNESS RANGE — compounds can be varied from extremely soft to bone hard.
9. NON-ADHERENT TO METAL — compounds will not adhere to metals even after prolonged contact under pressure. (Metal adhesions can be readily obtained when desired.)

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## *American Rubber*

### B. F. Goodrich Chemical Company

A DIVISION OF  
THE B. F. GOODRICH COMPANY

# PERSONALS

Recent Personnel Changes and Appointments at the Plants of Automotive and Aviation Manufacturers and Their Suppliers.

**Chrysler Corp., Chrysler Div.**—**John T. Condon** made Sales Executive of the division. He is succeeded as Manager of the Industrial Engine Div. of Chrysler Corp. by **John C. Hammel**.

**Bendix Aviation Corp., Pacific Div.**—**R. C. Fuller**, Asst. General Mgr.

**Westinghouse Electric Corp.**—**T. O. Armstrong**, director, Plant Labor Relations.

**International Nickel Co., Inc.**—**John M. Weldon** has been appointed Assistant to Vice-President **H. J. French**.

**Westinghouse Electric Corp.**—**Dr. Harvey C. Rentschler** has retired as head of lamp and electronic tube research at Bloomfield (N. J.) plant.

**Mack Trucks, Inc.**—**Harry Oldham** has been appointed superintendent of the New Brunswick (N. J.) foundry.

**Warren City Manufacturing Co.**—**Alfred W. Schultz**, named Director of Production and Planning Control.

**The Porter-Cable Machine Co.**—**Douglas M. Lyon**, Sales Manager, succeeding **H. L. Ramsey**, who has been made Vice-President in charge of Merchandising.

**Chrysler Corp., Plymouth Div.**—**Bruce K. Steele**, Asst. General Sales Mgr.

**The Asbestos Manufacturing Co.**—**S. E. Shepard**, Vice-President and General Sales Mgr.

**Stewart-Warner Corp.**—**Lynn A. Williams, Jr.**, resigned as Vice-President in charge of the South Wind Div., Indianapolis. **F. A. Hiter**, Senior Vice-President, assumes direct charge of the South Wind Div., in addition to his other duties. **D. C. Peterson**, Director of Engineering and Research, will succeed Mr. Williams as Chairman of the Engineering Committee.

**Thermoid Company, Automotive Div.**—**William V. Linn**, appointed Advertising and Sales Promotion Mgr.

**Continental-Diamond Fibre Co.**—**Harry M. Dexter** appointed Sales Manager.

**Willys-Overland Motors**—**George D. Pence**, appointed President of the Wilson Foundry and Machine Co. Div.

**Continental Motors Corp.**—**T. A. Engstrom** elected Vice-President and factory manager of Muskegon Division.

**The Autocar Co.**—**H. M. Coale**, Vice-President in charge of Sales has retired and is succeeded by **Edward F. Coogan**, previously Vice-President in charge of branch sales.

**Dearborn Motors Corp.**—**Harry V. Snow**, Tractor and Implement Sales Manager.

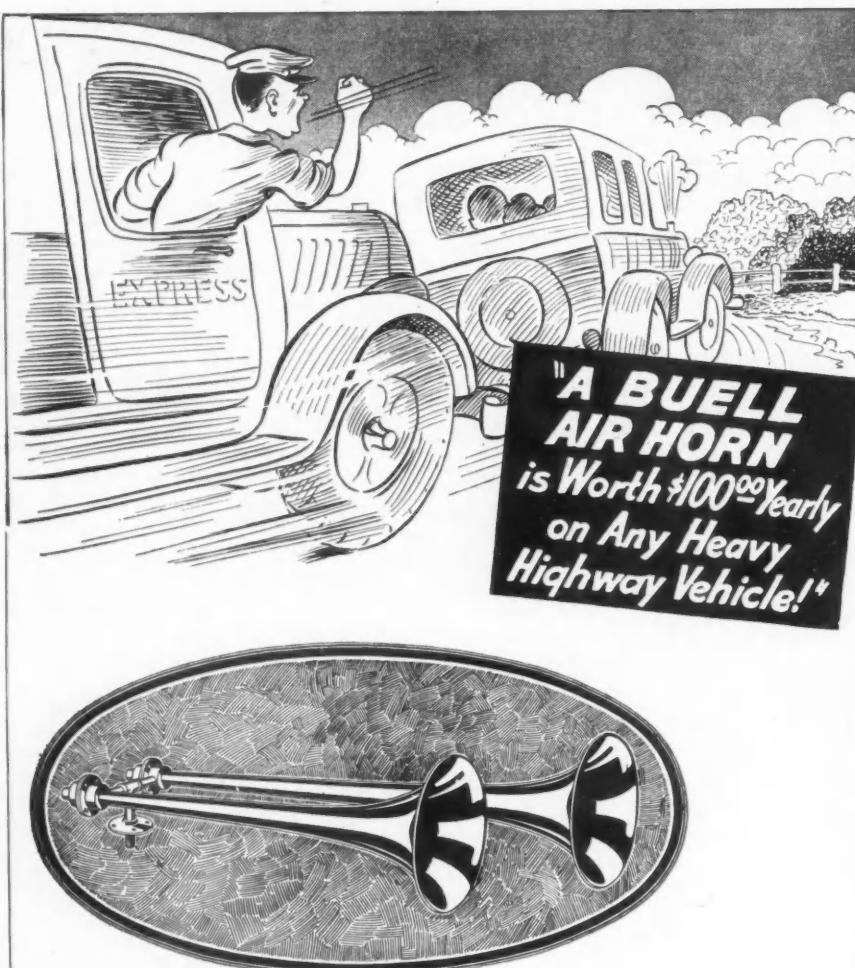
**Thermoid Co.**—**Harold C. Anderson** elected Vice-President of Research Engineering and Development.

**Peninsular Grinding Wheel Co.**—**George A. Custer**, elected Vice-President in Charge of Manufacturing.

**General Motors Corp., Chevrolet Motor Div.**—**J. H. Glass** appointed Plant Manager of the Chevrolet Commercial Body Div. at Indianapolis. **James H. Wechsler** becomes Asst. Plant Manager.

**Briggs Manufacturing Co.**—**Leo J. McPharlin**, Asst. Director of Purchases.

**Carboloy Co., Inc.**—**Robert L. Stickley**, appointed Distributor Promotion Specialist.



- Buell Air Horns are tops in warning signal efficiency.
- Installed as original equipment on many Trucks and Buses.
- They reduce maintenance costs by decreasing stops, starts and slowdowns.
- All records prove that they save tires, brakes, clutches and gears.
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With a Buell the driver has greater security, maintaining a steady cruising speed. Slowing a 20 ton load from 50 MPH to 30 MPH means destroying a lot of energy thru brake lining and tires. It is replaced by burning more gasoline, increasing load on engine and tires again, to regain speed. This all costs money. We believe a Buell Air Horn is worth \$100.00 yearly on any heavy highway vehicle. Then remember a Buell will last more than 10 years. How would you rate a \$100.00 investment that earned \$100.00 yearly for 10 years. Ask the man who has a Buell.

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## Publications Available

(Continued from page 54)

### D-22—Metricator Air Gage

Federal Products Corp.—Bulletin describing the Federal-Metricator Dimensional Air Gage. It has been compiled to instruct people who may be interested concerning the place the method of gaging dimensions by air takes in inspection. Various illustrations show how the Air Gage is used to advantage.

### D-23—Resistance Welding Electrode

Ampco Metal, Inc.—A new enlarged edition of bulletin No. 68-B, covering Ampcoloy Resistance Welding Electrodes and alloys catalogs a comprehensive line of spot welder tips and holders, seam welder wheels and other resistance welding accessories. The bulletin is illustrated with diagrams showing dimensions of tips and holders. It contains tables of properties of alloys, applications, stock sizes, etc.

### D-24—Plastics

G. Felsenfeld & Sons—24-page Reference Booklet on Plastics furnishes a handy guide to the varied uses of plastics by this concern. It discusses injection molding, blow molding, mold, tool and die-making, assembly and inspection, laminating, printing, spraying, etc. and heat sealing and their numerous industrial applications. Photographs of molded and fabricated industrial and electronic parts, including automobile parts, dials, nameplates, etc. are included, together with a valuable glossary of plastic terminology containing descriptions of the properties of the many plastics used by the company.

### D-25—Filters

Titeflex, Inc.—Folder describing the Titeflex filter, which features simplicity of operation with ease of cleaning. Also illustrated and described is the Titeflex all stainless laboratory filter.

### D-26—Rubber Transmission Belts

The B. F. Goodrich Co.—Tables and other technical data are included in a new 12-page catalog section on Selection and Maintenance of Rubber Transmission Belts. A section lists commonly used sizes, minimum pulley diameters for its various grades of belting and their horsepower capacity; a table of service factors of prime movers, used in connection with the rate horsepower of the driving unit to determine the estimated horsepower requirement used in selecting a belt, and rules for determining the horsepower.

# Multi-plying a good idea



Design engineers in industry were faced with the need for a bellows with extra strength for service far in excess of normal limits.

Standard metal bellows, ideal for most pressures, just couldn't stand the gaff.

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neers, working closely with these customers, developed a product now wide and favorably known as the Sylphon Multi-ply bellows.

Multi-ply bellows consist of two, three and four metal tubes fitted closely together and then corrugated as a unit — just as standard bellows are corrugated. The result is extra strength . . . sufficient to withstand high pressures . . . without excessive loss of flexibility.

Precision built by specialists with more than 45 years' experience, these rugged multi-ply bellows . . . like all Fulton Sylphon products . . . are engineered to do their job better, longer, at less cost to you.

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**FULTON SYLPHON**  
Temperature Controls      Bellows      Bellows Assemblies

Canadian Representatives, Darling Brothers, Montreal

## Federal Adds Five Truck Models

(Continued from page 27)

a rotator type valve mechanism on the exhaust valves. Another Federal feature is adoption of the larger Zenith 1 1/4 in. down-draft carburetor with oil bath air cleaner. The JXLD(F) engine develops 119 bhp at 2800 rpm and 264 lb-ft at 1200 rpm. Engines are fitted with Zollner, four-ring, heavy-duty aluminum pistons and a crankcase ventilating system with an oil bath breather. The clutch is Borg and Beck Model 13E, 13-in. with a lining area of 178

sq in. and torque capacity of 330 lb-ft.

The Clark Model 205-VO, five-speed overdrive transmission is standard equipment on all models except the 29MLA. The latter has the Clark 205-V five-speed direct-drive main transmission in combination with a Brown-Lipe 6231-B three-speed auxiliary.

Rear axle set-up is as follows: Model 25M, the Timken H-100-DPH hypoid single-speed axle with a ratio of 6.8 to

1, with lubricant capacity of 10 qt; Model 25ML2, the Timken H-300-DPH two-speed hypoid helical double-reduction axle with a high-range ratio of 6.13 to 1 and low range of 8.15 to 1; Model 29ML and 29MLA, the Timken L-100-DPH single-speed hypoid gear axle with ratio of 6.83 to 1; and Model 29ML2, the Timken L-300-DPH hypoid helical double-reduction axle with high-range ratio of 6.32 to 1 and low range of 8.22 to 1.

Front brakes are Lockheed hydraulic, 16 x 2 1/4 in. on the Series 25M, and 16 x 3 in. on the Series 29ML. Timken dual primary hydraulic brakes are standard at the rear on all models except the 29MLA, 16 1/4 x 3 1/2 in. on the Series 25M; 16 1/2 x 5 in. on the 29ML and 29ML2. The 29MLA has hydraulic brakes at the rear, and is fitted with the ACC Tru-Stop parking brake while the other models have drum type parking brakes. The Bendix Hydrovac vacuum self-contained power unit is standard on all models.

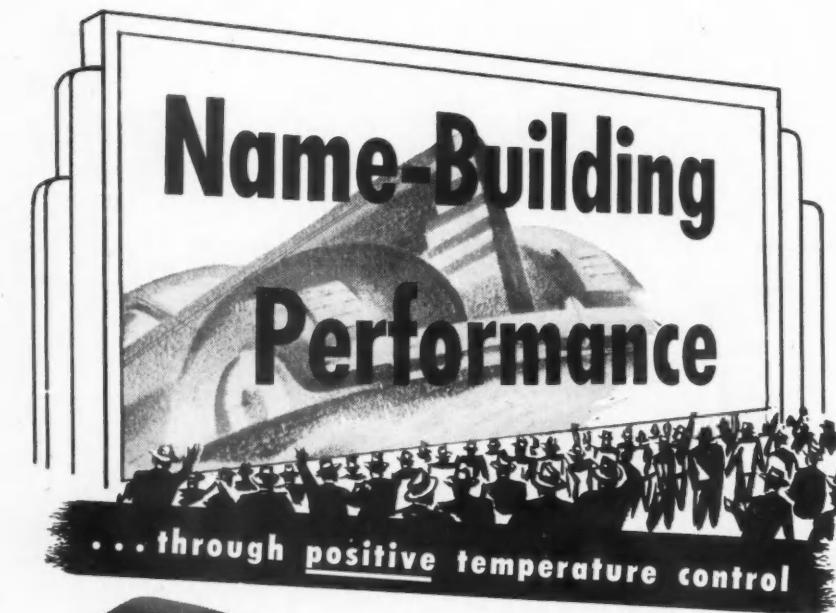
The Gemmer worm-and-roller steering gear with ratio of 18.5 to 1 is used on the Series 25M, while the triple-tooth worm-and-roller Gemmer gear of 20.4 to 1 ratio is found on the Series 29ML models. Needle bearing propeller shafts are used on all models, with torque capacity of 1900 lb-ft on the Series 25M, and 2750 lb-ft on the Series 29ML.

Among other features common to all models are the use of multiple type wiring with an individual fuse for each circuit, cold-riveted frames, all-steel cabs, waterproof oil-filled Delco-Remy coils and finger tip control on the instrument panel for vacuum power shifting of two-speed axles. In addition, both the crankcase and transmission are fitted with Lisle magnetic plugs which pick up metallic particles and prevent them from circulating with the lubricant.

All sheet metal is finished in a baked enamel in the full range of Federal color combinations. Dayton steel spoke wheels with 8.25 x 20 tires are standard on the Series 25M, with Budd six-stud disc wheels available at extra cost. Other options include Dayton and Budd six-stud disc wheels with 9.00 x 20 tires. Standard equipment on the Series 29ML are Dayton steel spoke wheels with 9.00 x 20 tires. Special equipment includes Budd 10-stud disc wheels with standard tires, and Dayton and Budd wheels with 10.00 x 20 tires.

### R. E. Olds Recovering From Pneumonia Attack

R. E. Olds, 83-year-old automobile pioneer and founder of the Reo and Oldsmobile Companies, is reported recovering from an attack of pneumonia at his home in Lansing.

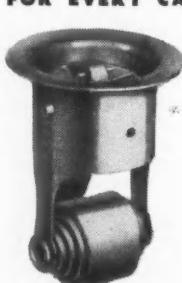
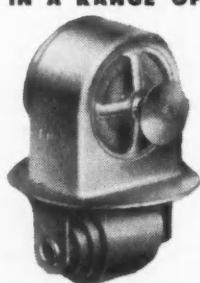


Effective motor temperature control—as achieved by Dole Thermostats—is a simple but highly practical contribution to name-building performance. At all seasons Dole Thermostats provide quick warm-up—with important savings in gas, oil and motor wear.

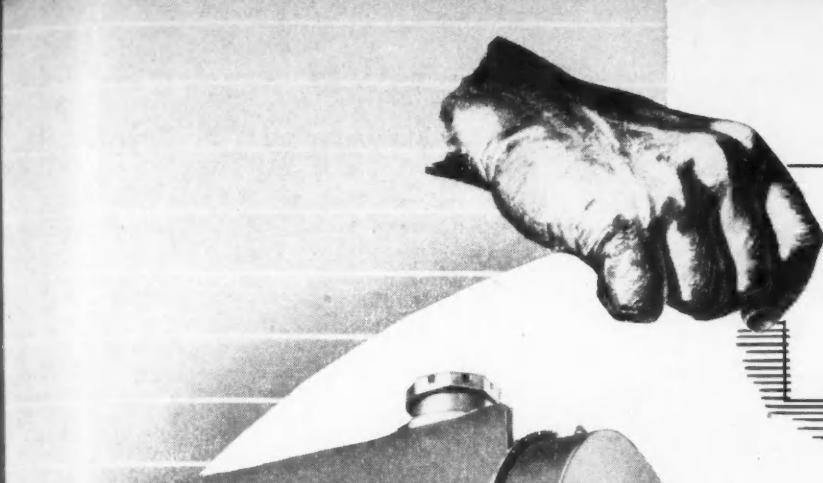
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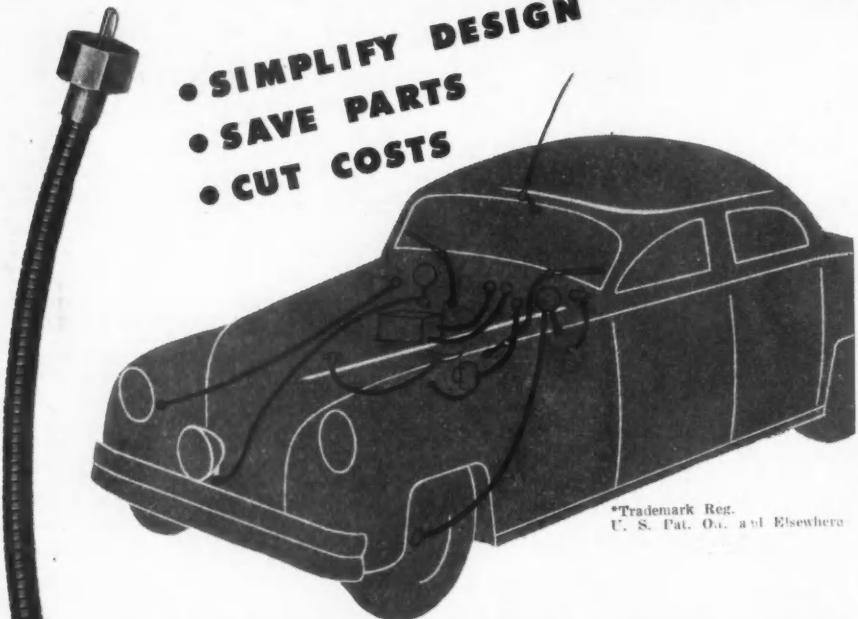
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## Business in Brief

Written by the Guaranty Trust Co.,  
New York, Exclusively for AUTO-  
MOTIVE INDUSTRIES

Continuing minor fluctuations in general business activity are indicated. The *New York Times* index for the week ended June 21 stands at 144.7, as against 146.4 for the preceding week and 132.9 a year ago.

Sales of department stores during the week ended June 21, as reported by the Federal Reserve Board, equaled 256 per cent of the 1935-39 average, as compared with 300 per cent in the week before. Sales were three per cent above the corresponding distribution a year earlier, as against a preceding similar excess of six per cent. The total in 1947 so far reported is 10 per cent greater than the comparable sum in 1946.

Electric power production increased slightly in the week ended June 21. The output was 13.3 per cent above the corresponding amount in 1946, as compared with a like advance of 16.7 per cent shown for the preceding week.

Railway freight loadings during the same period totaled 901,296 cars, 0.7 per cent more than the figure for the week before and 5.0 per cent above the corresponding number recorded last year.

Crude oil production in the week ended June 21 established a new record, averaging 5,114,500 barrels daily, or 1300 barrels more than the preceding average and 165,000 barrels above the comparable output in 1946.

Production of bituminous coal and lignite during the week ended June 21 is estimated at 12,900,000 net tons, 0.1 per cent more than the output in the week before. The total production in 1947 so far reported is 35.9 per cent above the corresponding quantity in 1946.

Civil engineering construction volume reported for the week ended June 26, according to *Engineering News-Record*, is \$143,470,000, or 52 per cent more than the preceding weekly figure and 12 per cent above the comparable sum in 1946. The total recorded for twenty-six weeks of this year is two per cent more than the corresponding amount in 1946. The increase in public construction is 19 per cent, but private construction is eight per cent below that a year ago.

The wholesale price index of the Bureau of Labor Statistics for the week ended June 21 is 147.8 per cent of the 1926 average, as compared with 147.6 for the preceding week and 112.4 a year ago.

Member bank reserve balances decreased \$160,000,000 during the week ended June 25. Underlying changes thus reflected include an advance of \$260,000,000 in Reserve bank credit and an increase of \$417,000,000 in Treasury deposits with Federal Reserve banks, accompanied by a decline of \$12,000,000 in money in circulation.

Total loans and investments of reporting member banks declined \$86,000,000 during the week ended June 25. An increase of \$25,000,000 in commercial, industrial and agricultural loans was recorded. The sum of these business loans, \$10,658,000,000, shows a net increase of \$3,129,000,000 in 12 months.



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# Wider Use of Exhaust Jet Cooling

(Continued from page 35)

piston and cylinder, which results in scoring and eventual freezing. By eliminating cooling drag and improving the streamlined shape of the power plant cowling, it affords improved performance of the airplane through added top speed and remarkable increase in the rate-of-climb, which has reached as high as 30 per cent in some installations. Of military value is its inherent flame dampening characteristics and

the large reductions in exhaust noise it provides ensures improved passenger and crew comfort.

The conversion of an existing power plant design to jet ejection cooling requires only a few simple considerations, the major task being achieving the proper balance between a number of different design objectives. The engine cowling must be completely sealed throughout its various sections with

the exception, of course, of the nose opening. This consideration enables the layout of a completely faired engine nacelle and, simultaneously, permits full cantilever cowl design with large hinged sections for engine access if desired. The optimum aerodynamic cowling shape may thus be used with resulting reductions in drag through the elimination of exit slots and cowl vibration and movement during flight.

The jet ejector is most efficient when the flow through it is steady. Therefore, it is necessary to provide a steady flow by connecting a number of exhaust ports whose exhaust valve openings do not overlap. Any three cylinders 120 deg apart may be joined into a single exhaust without exhaust valve opening overlapping. Simplest installation is the use of collector ring segments exiting into two jet ejectors, which avoids the maze of siamese and triamese exhaust manifolding otherwise required. The collector ring also simplifies the power plant section installation through cleaning up the region aft of the engine, thereby permitting more efficient cooling air flow into the ejectors.

The jet ejector inlet section is a flared, convergent passage with the exhaust exit mounted free one or two in. forward of it. This provides a free inlet for the induced cooling air and also provides for movement of the exhaust manifold, which is mounted on the engine while the jet ejector is mounted on the wing or fuselage structure. The ejector is rectangular in shape to conserve lateral space in the airplane and to simplify manufacture and mounting. The exhaust nozzle directing the exhaust into the jet ejector should be flattened to a form with slot about 12 to 15 times as long as its width for best ejector performance.

Calculations for the design of the jet ejector begin with data on the cooling requirements of the engine, which may be supplied by the manufacturer. These figures include: the amount of cooling air required, the total exhaust flow, the air pressure behind the engine, the temperature behind the engine and the pressure required of the jet ejector. These data may then be used for calculating the performance of the ejector for a number of different values of the throat pressure, the controlling factor in an ejector installation. The value of the throat pressure producing the greatest thrust is chosen and the corresponding throat area used for the design of the ejector.

An important factor in the throat pressure, however, is the design of the diffuser, or exit cone. A variable diffuser offers the best solution due to its ability to accommodate changes in engine cooling requirements. The diffuser

(Turn to page 76, please)

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The slip-on-the-transmission-shaft feature permits the spline, on this MECHANICS Roller Bearing UNIVERSAL JOINTS and tubular shaft assembly, to be lubricated by the lubricant in the transmission — eliminating the conventional reservoir and stub shaft. Let our engineers show you how this and other MECHANICS features will help you reduce weight and costs in your new model.



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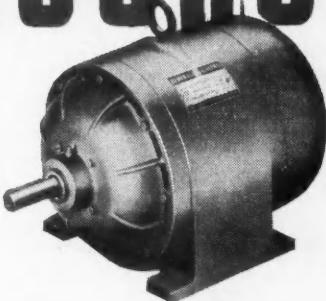
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Today, with the "family" including dripproof motors, vertical motors, gear-motors, capacitor-motors, and totally enclosed motors, the Tri-Clad motor is, more than ever, the motor that means basic protection, dependable performance, and minimum upkeep. *Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

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Rigid cast-iron frame and end shields protect vital parts from external abuse and prevent resonance. Because they're not at the mercy of a coat of paint, they strongly resist chemical attack and dampness. Cast iron also gives you tight, metal-to-metal fits between end shields and frame.

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Windings of Formex\* wire, together with improved insulating materials, reduce the chances of electrical failure. Heat is dissipated quickly — motor stays young for years and years.

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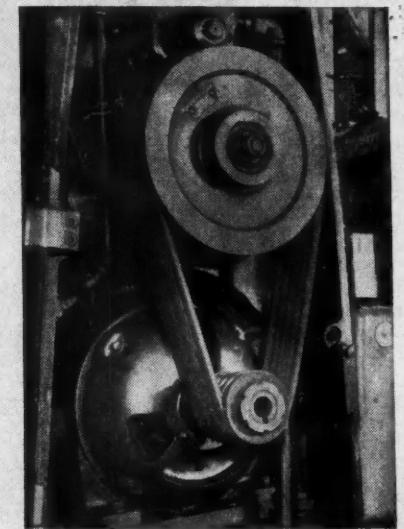
Bearing design affords longer life, greater capacity, improved lubrication features. Bearing seals retain lubricant, keep out dirt. One-piece, cast-aluminum rotor is practically indestructible.

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July 15, 1947

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**MOTORS**

# Exhaust Jet Cooling

(Continued from page 74)

controls the throat flow, which, in turn, controls the mass flow within the engine compartment. The most desirable arrangement is a variable diffuser door automatically controlled by engine temperature. There are several practical considerations affecting the design of a diffuser door at the aft end of the ejector, however, including both structural and aerodynamic limitations. The door must be large and this creates airloads requiring consid-

erable strength in the door and its operating mechanism. The door must be rigid enough in design to withstand vibration and to prevent fatigue failure. Its effective angle of operation cannot be large because if it is opened too far out into the airstream, it will stall and set up large drag loads requiring additional engine power to overcome, as in the conventional engine cowl flap.

The effect of increasing the diffuser

opening on the pressure rise in the mixing section can be seen in the fact that a straight jet with an area of 12 times the exhaust jet produces a pressure rise of only about eight in. of water compared to a rise of nearly 20 in. of water for a diffuser having an area twice that of mixing section and more than 25 in. when the ratio is four times that of the mixing section. Ratios of more than four show diminishing returns, however.

The size of the ejector is determined by the size of the exhaust area and varies from about eight, for large diffusers, to about sixteen for straight pipes with no diffuser door. The mixing section of the ejector should be a straight section in order to obtain a rise in pressure of the mixing gas and air as it passes through. A diverging mixing tube often produces an efflux of less than atmospheric pressure, resulting in no added thrust and very small pumping action. Curves in the mixing tube are permissible, however, providing a constant cross-sectional area is maintained. These may be necessary due to individual power plant installations and their losses are negligible.

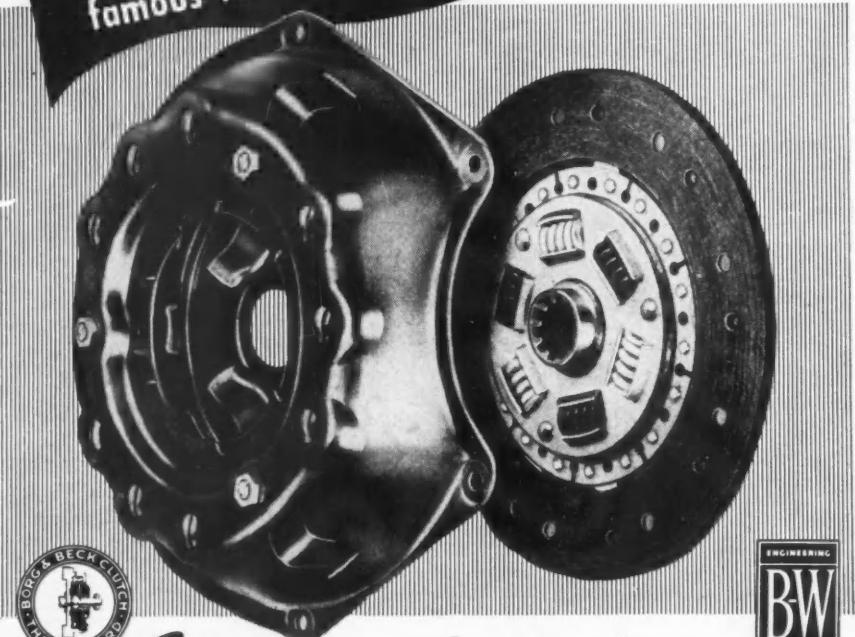
The high speed of the exhaust poses certain ejector problems, however, due to its frequent supersonic speed. High-power aircraft-engine exhaust velocities vary from 1600 fps at maximum cruising rpm to well over 200 fps at maximum power. This, in itself, presents small problem but its effect on the velocity of the mixture through the ejector is considerable. The performance of the ejector falls off rapidly when the speed of the mixed flow exceeds a Mach number of about 0.6. During the design stage, the mixed flow velocity must be determined and, in the event it exceeds this figure, the mixing tube area should be increased until this figure is obtained.

The effect of altitude on the performance of the jet ejector depends upon the purpose for which the ejector is designed. If its design is primarily for cooling purposes, its performance increases slightly as the airplane climbs from sea level to about 10,000 ft, after which it falls off fairly rapidly. The standard design mass flow ratio of six (cooling air flow of six times the exhaust flow) increases to almost seven at 10,000 ft, but falls steadily to about five at 35,000 ft. On the other hand, as a thrust augmentor, the performance of the jet ejector improves with altitude, developing a larger thrust ratio as the airplane climbs. This effect is due, principally, to the reduced density of the atmosphere and the consequent reduction in back-pressure on the diffuser exit.

The length of the mixing section plays an important part in the performance of the ejector. The performance is improved as the length of the mixing section increases from one to about three times the diameter. The performance is not appreciably affected

(Turn to page 80, please)

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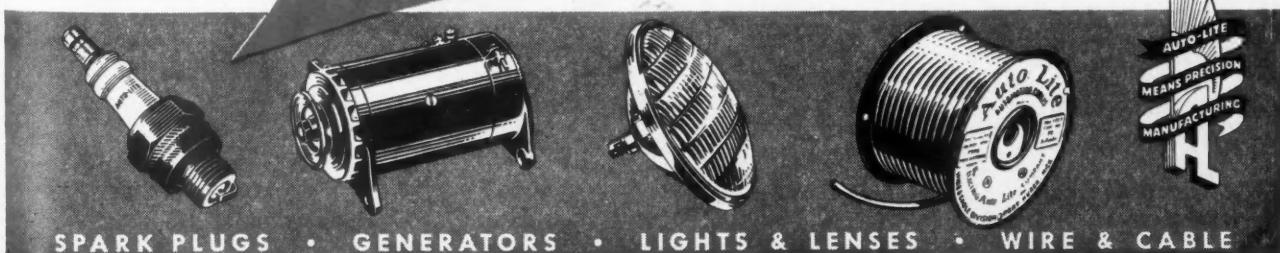


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For additional information regarding any of these items, please use coupon on page 54

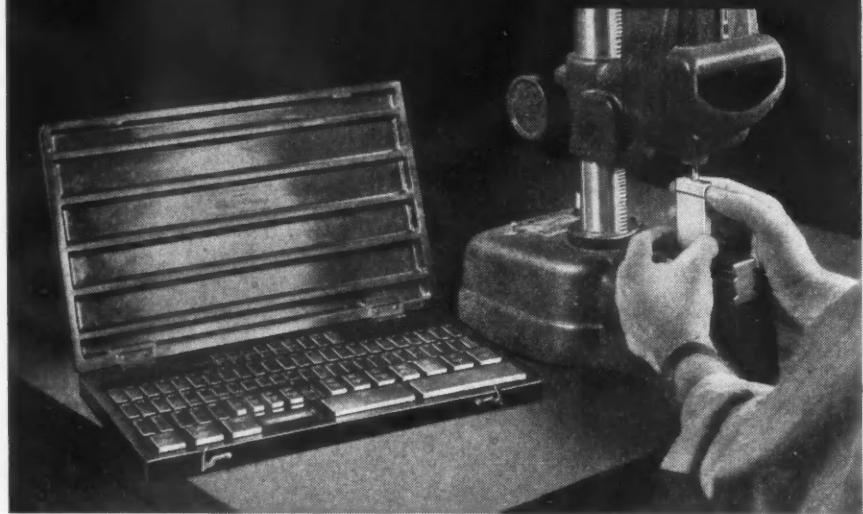
(Continued from page 58)

approach lights, runway designator, and runway lights.

Thirty-six krypton flash units each with a brilliancy of 3,300,000,000 peak beam cp are placed in line alternately with 36 neon blaze units for a distance of almost three-quarters of a mile from

the approach portal to the start of the runway. The krypton lamps are only four in. long but when a surge of electricity heats the gas to incandescence, the lamp flashes with a maximum brightness of nine-million cp per sq in. The reflector and optical system of the

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lighting fixture concentrate this flash to three and a third billion cp.

When flashed rapidly, one after another, the line of lamps appears like a stroke of lightning traveling toward the airport landing strip. Flashing 40 times a minute, this line of vivid light can be seen for at least 1000 ft even in zero-zero visibility.

In clearer weather, intensity of the approach lights is reduced and the krypton units can be turned off in favor of the less brilliant neon blaze units that can be used as either flashing or steady-burning lamps. Brilliance of the neon units can be reduced to as little as 100 cp on clear nights.

An 83-ft combination red cross or green arrow serves to direct runway traffic. As the pilot approaches the beginning of the runway, he sees on the ground a brilliant green arrow 83 ft long, indicating that the runway is all clear for his landing. This is called the runway designator. If for some reason, the runway is not clear, the designator is changed to a high flashing red cross. The arrow and cross are formed by green Zeon or red neon tubular lamps.

New, powerful runway lights will give the pilot an accurate picture of the runway's width and direction. These high-intensity runway lights are spaced at 200-ft intervals along the runway border. Each light can cast a steady penetrating beam of 100,000 cp intensity—about 100 times brighter than the runway lights now in commercial use. Although 100,000 cp can be used in worst visibility conditions, brightness can be reduced gradually to five cp for clear night operation.

To help make foggy weather landings routine for pilots, two approach angle indicators are installed near the head of the runway. These tell pilots in clear weather that they are coming in at exactly the right altitude for a perfect landing. Projecting a tri-color beam, sharply divided into horizontal layers, these indicators appear as flashing yellow lights if the plane is too high, red if it is too low, and green when the rate of descent is correct.

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Besides the new oil, Shell has also developed a new general purpose aircraft grease, called "AeroShell Grease 6," which can be used to handle about 90 per cent of required aircraft lubrication, including wheel bearings and general airframe applications. The new grease is stable, and incorporates corrosion-resistant properties.

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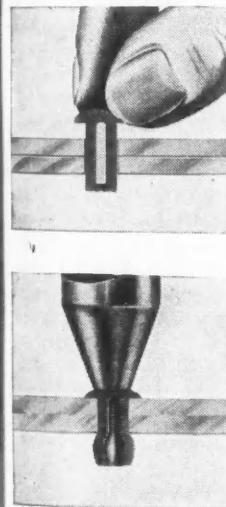
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The illustrations at the right are examples of typical applications.

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Simply insert Rivet in prepared hole and apply tip of Du Pont Riveting Iron to Rivet head. Cavity in full length of Rivet shank contains a minute, non-corrosive charge. Heat fires the charge. Shank expands . . . fills hole completely. Close hole tolerances are therefore unnecessary. Barrel-shaped head on opposite end of Rivet locks it securely in place. No rivet-finishing operations are required, and there are no parts to vibrate loose.

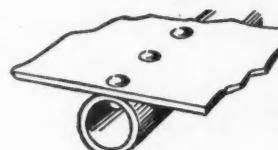
Many manufacturers have found it well worth while to investigate the advantages offered by Explosive Rivets. Write today for manual containing the complete story, E. I. du Pont de Nemours & Co. (Inc.), Explosives Dept., Wilmington 98, Del.

## OUTSTANDING FEATURES OF EXPLOSIVE RIVETS

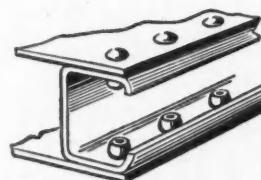
1. Easy to insert . . . close hole tolerances unnecessary.
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3. Large grip range permits wide use of each Rivet size.
4. Strength comparable to solid Rivets.
5. One piece . . . no parts to vibrate loose.
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7. Safe to handle . . . use . . . store.



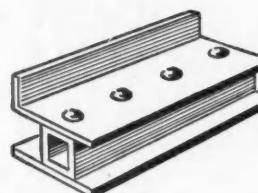
## EXPLOSIVE RIVETS MAKE THESE FASTENING OPERATIONS EASY



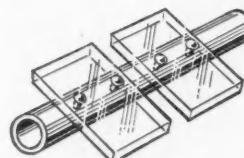
Metal sheet quickly attached to tubular member. Note area occupied by blind head of copper Explosive Rivet.



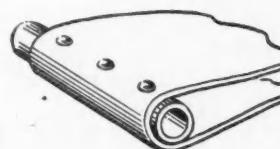
Aluminum sheets readily fastened to U-shaped member with Explosive Rivets of 17S-T aluminum alloy.



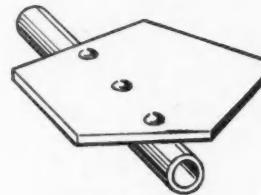
Hard-rubber angle sections secured to square section with Explosive Rivets. Wide grip range allows for varying thicknesses of materials.



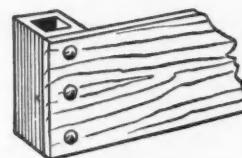
Plastic strips joined to magnesium tube using Explosive Rivets of 56-S aluminum alloy.



Leather flap "sewed" to tubular frame with Explosive Rivets of aluminum alloys, brass and copper.



Fibreboard gusset easily attached to tubular member with Explosive Rivets of 52-S aluminum alloy.



Plywood riveted to square aluminum column using Explosive Rivets of aluminum alloy.

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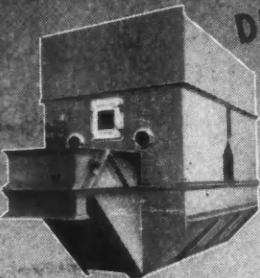
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## Jet Cooling

(Continued from page 76)

by length/diameter ratios of three to six but falls off appreciably as the length is increased. This effect is created by the improved mixing as the ratio is increased from one to six. Longer mixing sections with increased internal friction between the fluid and the walls make this latter an increasing proportion of the energy in the stream and create increasing losses in performance.

The jet ejector is one of the simplest devices to design once the diameter or area of the throat has been determined by the cooling requirements of the engine. The entrance is simply a converging passage and the angle of convergence is not critical. The lips may vary between one-sixth the radius of the mixing section up to three or four times the radius. The mixing section may be straight, curved or with two or three bends in it so long as the area remains constant. The diffuser angle is not critical in the case of adjustable doors, other than the problems previously mentioned and, for fixed diffusers, an exit conical angle of about 8 deg is sufficient.

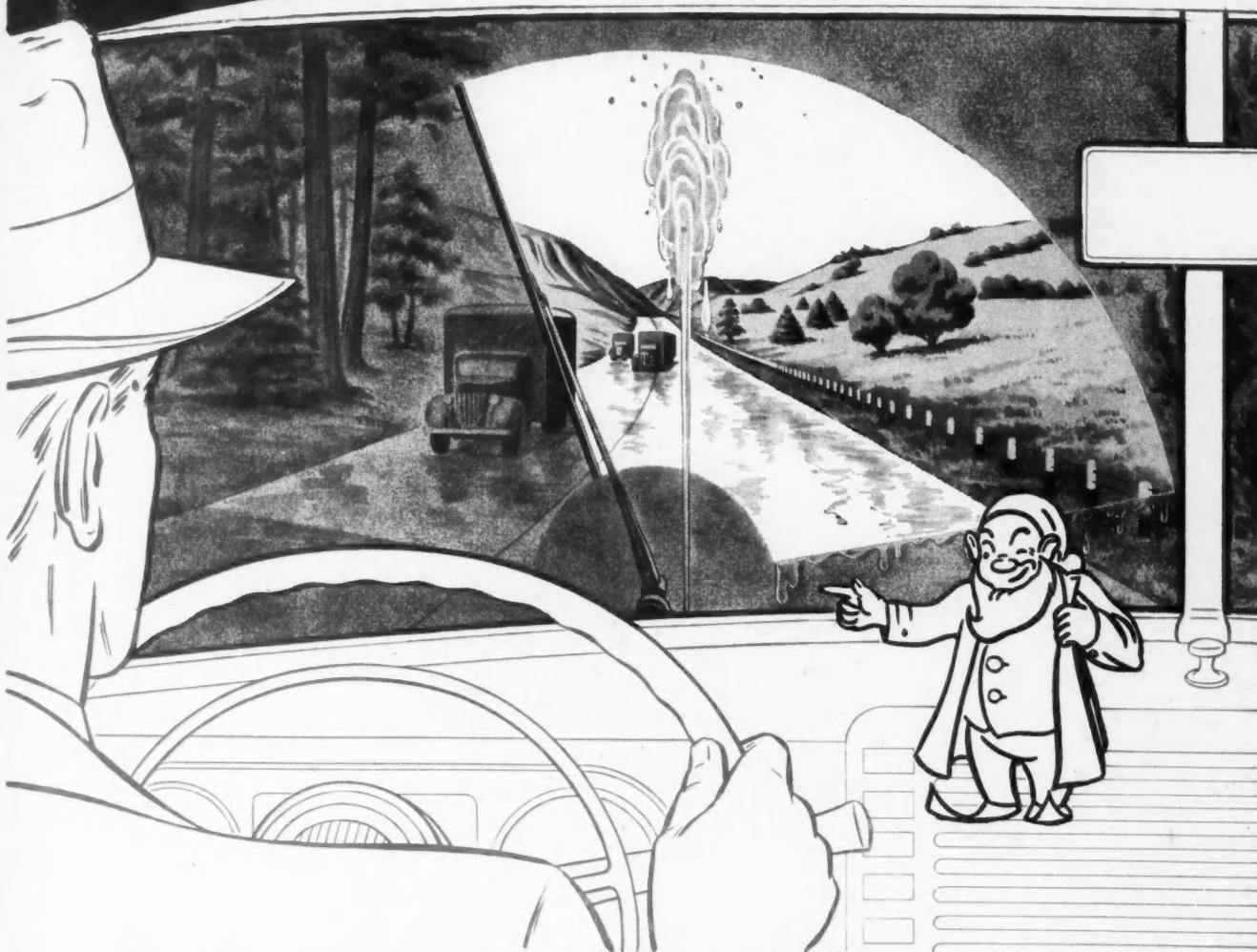
As in all things mechanical, however, there are certain features which cannot be overlooked in an analysis of its advantages. It might appear, at first glance, that the jet ejector is a method of "getting something for nothing." However, current installations are considerably heavier than conventional exhaust systems and this weight must be charged against engine power in a comparison with the amount of cooling power it eliminates. It also reduces the amount of thrust contained in the exhaust system by diverting much of this energy to cooling purposes. Although added thrust is available from a jet ejector cooling installation, it is considerably less than straight ejector exhaust stacks on each individual cylinder produce. The noise of this latter installation is, however, a major objection.

The applicability of jet ejector cooling to all types of aircraft, regardless of power or speed is evidenced by the wide variety of installations now being developed. Outstanding example of high-speed commercial transport installation is that of the Consolidated Vultee Convair-240 airliner now in quantity production (AUTOMOTIVE AND AVIATION INDUSTRIES, April 15, 1947, issue). This installation represents the combined cooling and added thrust design, which is certain to predominate over specialized installation in fixed wing aircraft. This installation provides approximately 200 lb of thrust per engine for climbing purposes, which increases the payload of the airplane as much as 2000 lb in certain CAA categories of performance. Through the use of jet ejector design, the Convair-240 cooling

(Turn to page 82, please)

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# Exhaust Jet Cooling

(Continued from page 80)

is greatly improved under all conditions, noise is reduced, drag is reduced and performance increased.

Its use on military aircraft offers even greater gains because fewer compromises need be made in its design. An outstanding example of combat plane installation is the system used on the Kaiser Fleetwings XBT-1 Navy torpedo-bomber plane designed and built during the war. This system varied considerably from that used on

the Convair-240 because of its single-engine design. In the XBT-1, the jet ejectors were placed along the fuselage, one on either side of pilot's cabin. The ducts were rectangular in shape, lying flush with the fuselage, the exit located near the trailing edge of the wing. In this system, adequate cooling is provided plus about 120 hp of additional thrust.

Bell Aircraft Corp. and the Sikorsky Division of United Aircraft Corp. have

made extensive design studies of the application of jet ejector cooling to the helicopter with promising results and both firms will shortly announce production designs utilizing this principle. A fundamental problem of the helicopter application, however, is the all-too-familiar solution to one problem creating another. The prevalent helicopter power plant system utilizes a cooling fan to cool the engine. This fan also comprises a flywheel for the engine for idling purposes, since the rotor is declutched during ground operation. Elimination of this fan by jet ejector cooling automatically creates a flywheel problem. Bell's solution is to use both the jet ejector principle and the flywheel, both, however, made smaller and lighter than their installation singly would have demanded. The helicopter offers a fertile field for jet ejector development, however, due to its long periods of operation at zero forward speed and in directions sideways and aft away from the forward location of a cooling air intake.

The jet-propelled military plane utilizes the basic principles of the jet ejector although in a considerably different manner. Most British and some American turbojet installations employ a sleeve about the tailpipe for the circulation of cooling air drawn aft by the ejector action of the jet nozzle. The ratio of cooling air to exhaust gas, however, is considerably lower than the six of reciprocating engines, actually being fractional. However, the coming use of boundary layer control, in which air is drawn from slots in wings to reduce their drag, will utilize the jet ejector principle for the pumping action required.

Experimental installations of jet ejector cooling in the automotive field have been made, one outstanding example being an installation designed by Usines Chasson, automobile radiator manufacturers in Asnieres, Paris, France. At the suggestion of Henri Coanda, a Rumanian engineer, and one of the pioneers of jet ejector development (AUTOMOTIVE AND AVIATION INDUSTRIES, Feb. 15, 1946 issue), Usines Chasson designed an ejector 150 mm in diam with a flow ratio of 20, more than three times that used in current installations. This ejector was fitted to a Citroen automobile and tests were carried out. However, the Citroen is powered by a four-cylinder engine, which produced a pulsating flow in the ejector and markedly lowered its performance. Tests of automotive ejectors are continuing, however, and the inherent advantages of the system are as applicable to automobiles, tractors, buses, tanks and motorboats as they have proved to be in aircraft.

Assuredly, jet ejector cooling promises a broad new field of investigation for modern science and comprises another remarkable chapter in the story of mechanical progress through the application of old principles to new applications.



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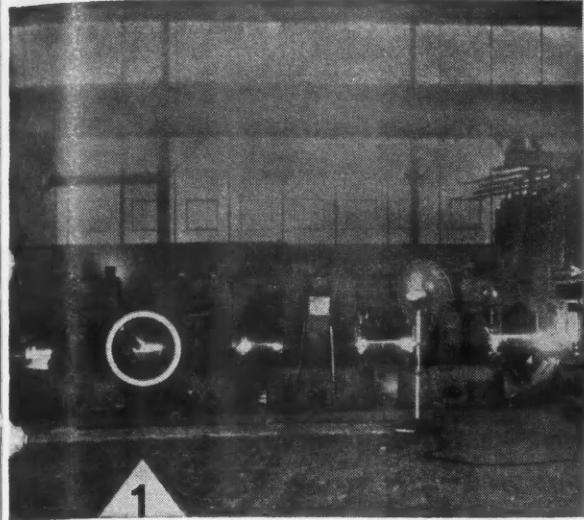
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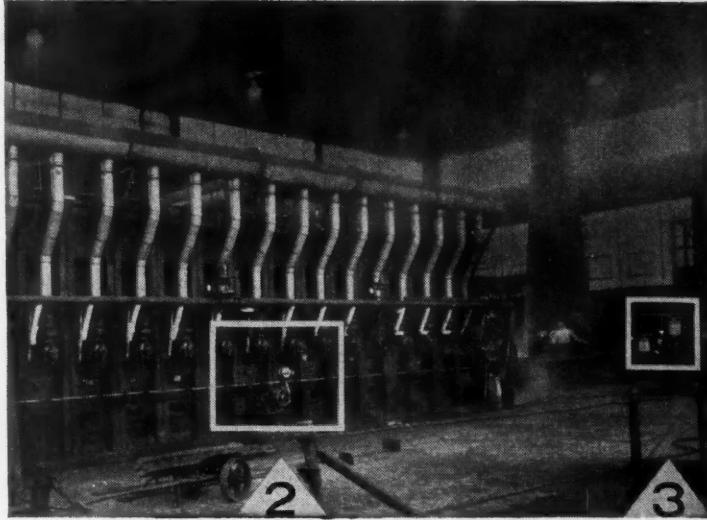


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1



2

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## NARROW TEMPERATURE BAND FOR ROEBLING'S ROD ROLLING Held by L&N Pyrometers on Furnace and Mill

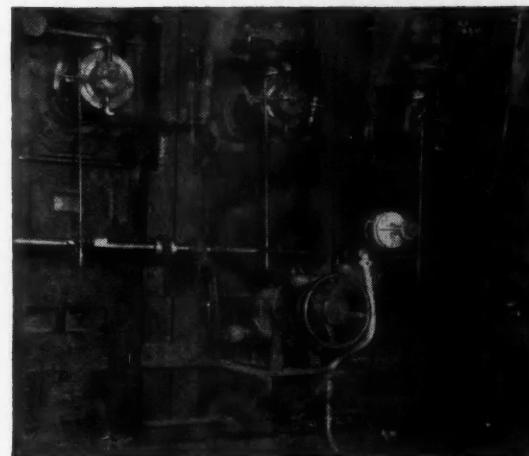
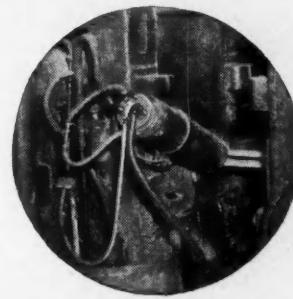
Automatic control which can be applied to many complex temperature problems is illustrated by the pyrometer setup in John A. Roebling's rod rolling plant. Two L&N Pyrometers, with Rayotubes as detectors, work as a team to maintain correct rod temperature both before and during rolling.

A Micromax instrument records the temperature of the big 15-burner oil-fired Morgan furnace, and through its Control Unit activates the valve drive which regulates heating of the whole furnace. A Speedomax Recorder supplies a continuous, prompt record of rod surface temperature, as the rods move through the rolling mill.

With the information that these micro-sensitive and dependable instruments give, the operator can avoid the cobbles which result if rods are fed into the mill too hot, and the flats and "finny" ends which are the penalty for too cold rods. The overall result is smoother production, with practically no rejects.

Catalogs N-33B and ND46(1) describe the two pyrometers. If you have a particular problem, an L&N field engineer will be glad to discuss it with you.

1 Temperature of Rod in Mill. Rayotube in water jacket sights on two rods as they enter the third pass of the Morgan Mill. Rayotube reports temperature to Speedomax for recording. John A. Roebling's Sons Co., Roebling, N. J. plant.



2 Furnace temperature is detected by the Rayotube shown projecting into the furnace wall, and recorded by a Micromax Pyrometer. Control is through the Drive Unit, linked to each of the fifteen Hauck burners, for regulating both fuel and air to the Morgan Engineering Company furnace.



3 Left-hand instrument is the Speedomax Recorder which records temperature of rods passing through mill, photo (1). Beside it, the Micromax instrument controls furnace temperature (2).



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July 15, 1947

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# Experimental Suspension System

(Continued from page 43)

Consequently any desired curve rate can be obtained by design; that is, with a parallel rate of 133.6 lb per in., a curve rate of 168 lb per in. or more can be chosen. Such a car has its least spring resistance with parallel spring action, which means that this car, while being driven, has the tendency to bounce parallel with the ground and in curves has a considerable smaller tilt.

The rear coil-spring arrangement is

shown in Fig. 5. By locating point X of this system lower than the corresponding wheel center, an additional good understeer is obtained; and the car's roll-center is flawlessly free of any torsional moments. If the connecting line between the pivot points of the front wheel carrier arms meets this point X, all additional torsional moments are eliminated.

However, experiments have shown

that this geometry of the front axle can be neglected if the wheel carrier arms have sufficient elasticity in order to meet this point by self-adjustment. It is important to locate point X for the rear spring system lower than the wheel center, especially on account of understeer, which guarantees a correct straight-on driving (no continuous adjustment with the steering wheel). It also creates an additional force, which tends to keep the car floating and counteracts the spring forces.

When the extensions of all spring centers meet the vertical extension of the center of gravity, all additional forces which torsionally stress the car should be eliminated. When designing a frame it should be observed that all forces are efficacious at the spring center and not at the wheel center, as formerly practiced. Similar to the operation of the keys of a piano, the four springs should be reciprocally stressed.

The above is an extract from the FIAT (Field Information Agency, Technical) Report 412, "Passenger Car and Truck Chassis," by Austin M. Wolf, Joint Intelligence Objectives Agency.

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## CALENDAR

### Conventions and Meetings

Institute of the Aeronautical Sciences, Annual Summer Mtg., Los Angeles, Aug. 7-8
Soc. of Automotive Engineers—West Coast Transportation & Maintenance Mtg., Los Angeles... Aug. 21-23
Natl. Air Races, Cleveland... Aug. 30-Sept. 1
Amer. Soc. of Mechanical Engineers—Fall Mtg., Salt Lake City.... Sept. 1-4
Amer. Soc. of Mechanical Engineers—Ind. Instrument & Regulators Div., Chicago ..... Sept. 8-9
Instrument Society of America Conference, Chicago ..... Sept. 8-12
Society of Automotive Engineers—Tractor Mtg., Milwaukee... Sept. 17-18
Natl. Machine Tool Builders Assoc. Machine Tool Show, Chicago, Sept. 17-26
Soc. Automotive Engineers, Aeronautic Mtg., Los Angeles ..... Oct. 2-4
French Automobile Salon, Paris... Oct. 2-12
Amer. Soc. of Mechanical Engineers, Petroleum Mech. Eng. Conf., Houston, Tex. .... Oct. 6-8
Natl. Conference of Industrial Hydraulics, Chicago ..... Oct. 16-17
Natl. Metal Exposition, Chicago. Oct. 18-24
Soc. of Automotive Engineers, Production, Cleveland ..... Oct. 20-21
Amer. Soc. for Metals, Chicago, Annual Mtg. .... Oct. 20-24
Amer. Welding Soc., Chicago—Annual Meeting ..... Oct. 20-24
Amer. Soc. Tool Engineers—Semi-Annual Mtg., Boston.... Oct. 30-Nov. 1
Amer. Society of Body Engineers, Annual Tech. Convention, Detroit, Nov. 5-7
Society of Automotive Engineers, Fuels & Lubricants Mtg., Tulsa.... Nov. 6-7
Society of Automotive Engineers—Air Transport Mtg., Kansas City. Dec. 1-3
Amer. Soc. of Mechanical Engineers, Annual Mtg., Atlantic City.... Dec. 1-5
Natl. Standard Parts Assoc., Chicago —Convention ..... Dec. 5-6
Automotive Service Industries Show, Chicago ..... Dec. 8-13
Soc. of Automotive Engineers Annual Mtg., Detroit ..... Jan. 12-16

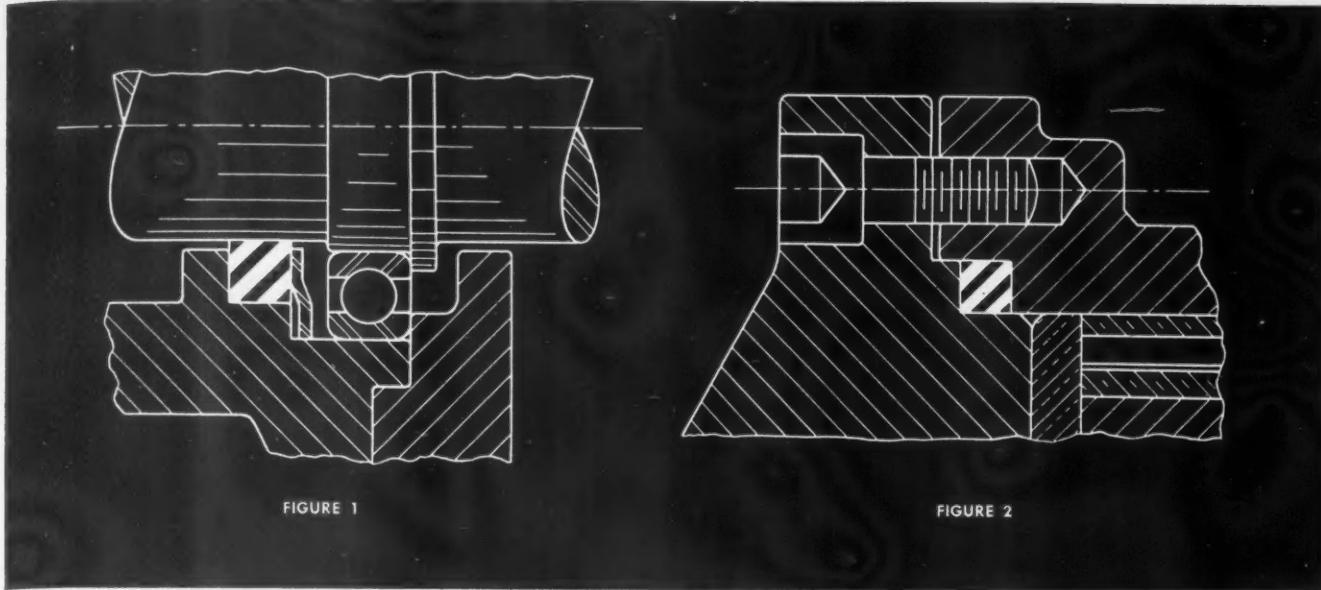


FIGURE 1

FIGURE 2

## SEALING ROTARY PUMP SHAFTS EFFICIENTLY

**Simple compressible rings are effective and economical**

Simple compressible rings provide efficient and inexpensive means of sealing rotary pump shafts. Such rings effectively prevent seepage of air into the pump as well as leakage of the pumped medium. Since this kind of seal does not depend for its effectiveness upon springs, fingers, or other mechanical parts, it is relatively low in cost.

Armstrong's Cork-and-Synthetic-Rubber Compositions make effective ring-type seals. These compositions combine the properties of the various synthetic rubbers with the true compressibility of cork. Under compression, each air-filled cell of cork acts as a self-contained spring. Constant radial pressure is maintained against the shaft without extrusion of the sealing material.

While cork-and-synthetic compositions normally are high-friction materials, scoring and friction losses are easily prevented by a factory-applied lubricant. One lubrication lasts for the life of the seal.

Figure 1, given above, shows the load end of a vane-type pump. This unit is designed to operate with light oil at 1,000 psi, at a maximum temperature of 158° F. Assembled seals had been used on some models and a low-priced composition seal on others. Assembled seals were expensive and called for close assembly tolerances. Composition seals tended to take a permanent set and leaks often resulted.

DC-100, one of Armstrong's Cork-and-Synthetic-Rubber Compositions, now is specified for all models

of these pumps. DC-100 prevents aeration problems as well as loss of pumped fluids. It provides a greater safety factor and gives a more positive seal for a longer period of time. Its compressibility allows the manufacturer to widen his tolerances, thereby effecting machine-time savings. Compressibility also enables this material to absorb lateral compression without extruding in a radial direction.

Figure 2 shows DC-100 used also as a head gasket in the same pump. This material provides a much greater safety factor than the material previously used. Nevertheless, gasket cost is practically the same because gasket volume could be considerably reduced. DC-100 also permits metal-to-metal contact. Thus cumulative tolerances may easily be taken up. Furthermore, since DC-100 is not fragile, this gasket can be re-used if desired when disassembly in the field is necessary.

Because of conditions present in your particular application, DC-100 may not be the material we'd recommend for you. We suggest, therefore, that you discuss your sealing or gasketing problem with an Armstrong Representative when you are designing or redesigning your equipment. He'll suggest suitable materials and provide samples for testing.

If you prefer, send details and working drawings to us for review. You will find our recommendations keyed to good current gasketing practice.



SEND FOR FREE BOOKLET. Write for the new, 20-page 1947 edition of "Armstrong's Gasket and Sealing Materials." It includes specification data on more than 40 of Armstrong's resilient sealing materials and also helpful hints on their proper application. Write to Armstrong Cork Co., Gaskets and Packings Dept., 1507 Arch Street, Lancaster, Pa.

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## Ford Redesigns for Radiator Production

(Continued from page 45)

designed to speed production is already in operation and several examples are illustrated here. The first of these is an automatic acid dip for radiator cores. It is a simple piece of equipment, as illustrated, provided with a rotary table containing ten fixtures. The operator loads the core in vertical position, the fixture then lowers to a horizontal position just as it reaches the station at which the stream of acid is caused to flow over it from a weir. During the rest of the cycle the overflow of acid drips off, leaving the core rough dry in readiness for baking in the adjacent oven.

The baking oven, pictured here, is fed by a merry-go-round table conveyor, permitting loading and unloading at one station. The temperature of the oven is regulated somewhere between 500 and 575°F depending upon the condition of the metal in a given batch of cores. It may be observed in this connection that the temper of the copper and brass used in the cores varies with the source of supply and requires careful control in the baking process.

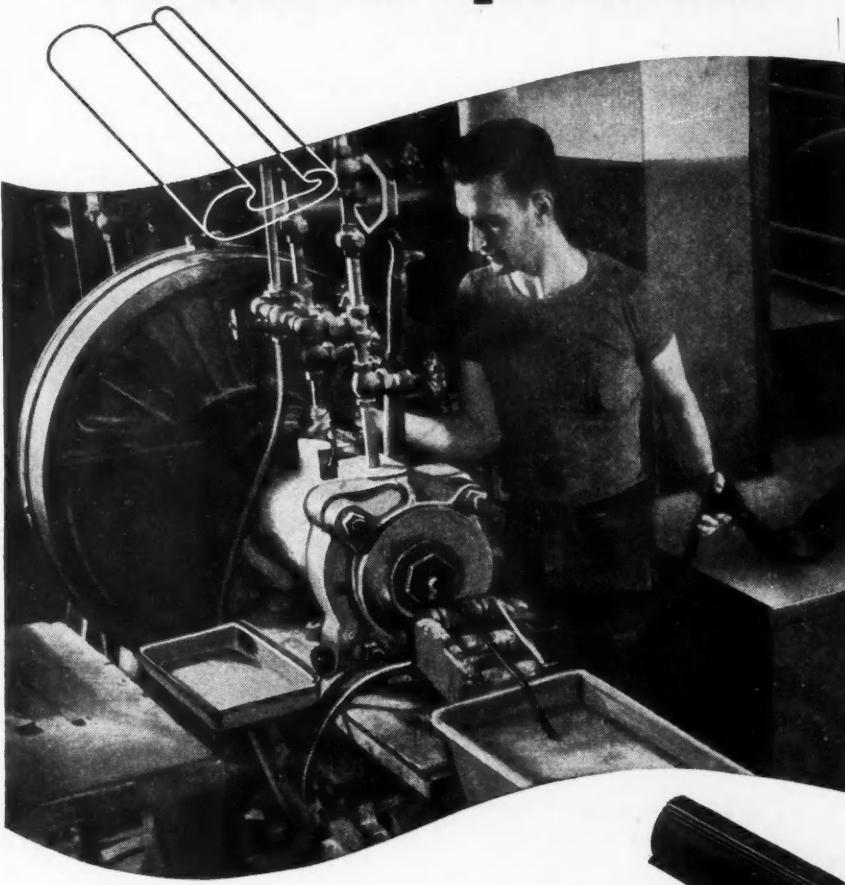
The third of the major items of equipment highspotted in this study is the header "burner" furnace which is used for soldering to the core the upper and lower headers, following the preceding operation of expanding the tube ends over the header. It may be noted that solder for the burning operation is applied in the form of a punched gasket installed over the tubes and directly under the headers before the expanding operation. As shown, the cores are mounted in vertical position on the mechanized feeder conveyor, the conveyor being arranged to shift the position of the fixture appropriately while moving past the burners.

Burners are arranged in an inclined line starting high so as to reach the top of largest core. The temperature of the flame is adjusted to provide a gradual melting of solder so as to prevent burning out. During the process, the melting solder runs down the tubes to provide a leak-proof joint at the header, the surplus running off into a trough at the lower end which carries the solder out of the furnace through a spout for salvage. Upon passing the center of the machine, the fixtures reverse the position of the core so as to "burn" the other header.

Other important changes in layout and equipment will be made shortly. Among these they will discard the infra-red paint baking tunnel in favor of a new baking oven.

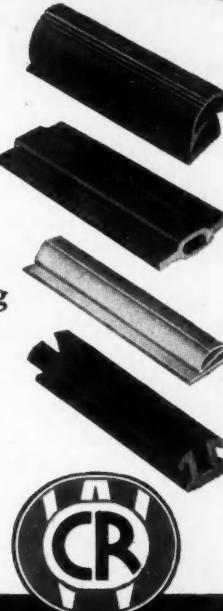
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## Light and Medium Trucks by GMC

(Continued from page 39)

Among the features of general interest common to all models are the following: heavier frame equal in strength and rigidity to pre-war frame with fishplates; clutch and brake pedal are fitted on the frame in a more rigid mounting to reduce vibration and make them readily accessible for servicing; clutch pedal linkage is improved to reduce pedal pressure, making release pressure on the larger models no greater than on light models; the steering column also is frame mounted for greater

rigidity and easier servicing; radiator is mounted and stabilized on a large, single rubber mount at the center, making it free from the effects of frame twist; molded rubber strips attached to the radiator frame prevent recirculation of hot air and tend to reduce radiator core vibration; and metal baffle plates have been eliminated, while bolts replace sheet metal screws in the assembly.

Radiators have been improved further by using larger cores together with

large inlet and outlet water connections to eliminate excessive water pressure in the block. The new radiators are fitted with an overflow tank built into the top. The pressurized cooling system mentioned on the models 400 through 470 is available as optional equipment on the lighter models, the system being held at four lb. A safety valve located in the secondary tank protects the system against excessive pressure.

The improved 228, 248 and 270 engines used in the new line remain the same in specification detail, but incorporate many new features developed progressively in recent years. Among these are the following: tocco hardened crankshafts; two-piece exhaust valve inserts; positive crankcase ventilation; water by-pass in cooling system; moraine sintered bearings; deep sump-type oil pans in Model 300 and up; and one-pint oil-bath air-cleaners standard in models 300 and up. For greater accessibility the battery is mounted outside the frame under the floor boards. A spare-tire carrier is standard on all models.

Power shift is standard on all two-speed axles and dual performance axles. It is operated by vacuum with hydraulic brakes and by air when air brakes are specified. With vacuum brakes a reserve tank is provided to assure an easy shift. New vacuum connections of screw-fitted type replace the former slip-fit hose connections.

For driver comfort GMC offers a line of new cabs longer and wider both at the cowl and across the seat, with two in. added to windshield height for better visibility. For wet weather driving there is provision of a sealed waterproofed windshield and installation of the two wipers at the bottom. Cowl ventilators located on the top and side make summer and winter driving more comfortable. In addition, louvered openings on the right side of the cowl are designed for the attachment of a fresh air heater. The cowl ventilator screen is standard. For increased comfort the dash is completely insulated and sound proofed, even around clutch and brake pedal openings.

A better ride for the driver is afforded by the longer and softer front springs together with improved seat cushions. The cushions have about twice the number of seat springs, each of which is fitted in a burlap bag. Seats are trimmed with rubberized hair pads with a maroon imitation leather coverings.

Cabs now have a three-point mounting and, in addition, have rubber stabilizers mounted on the rear of each side of the cab to prevent direct contact between the cab and frame. This frees the cab of the effects of frame weave.

A deluxe cab, available as an option on the Series 100 through 350, has all of the features of the standard cab plus the addition of rear-quarter windows and bright metal windshield frame and

(Turn to page 92, please)

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"Palnut" double-locking action is unaffected by vibration — holds regular nut to original tightness.

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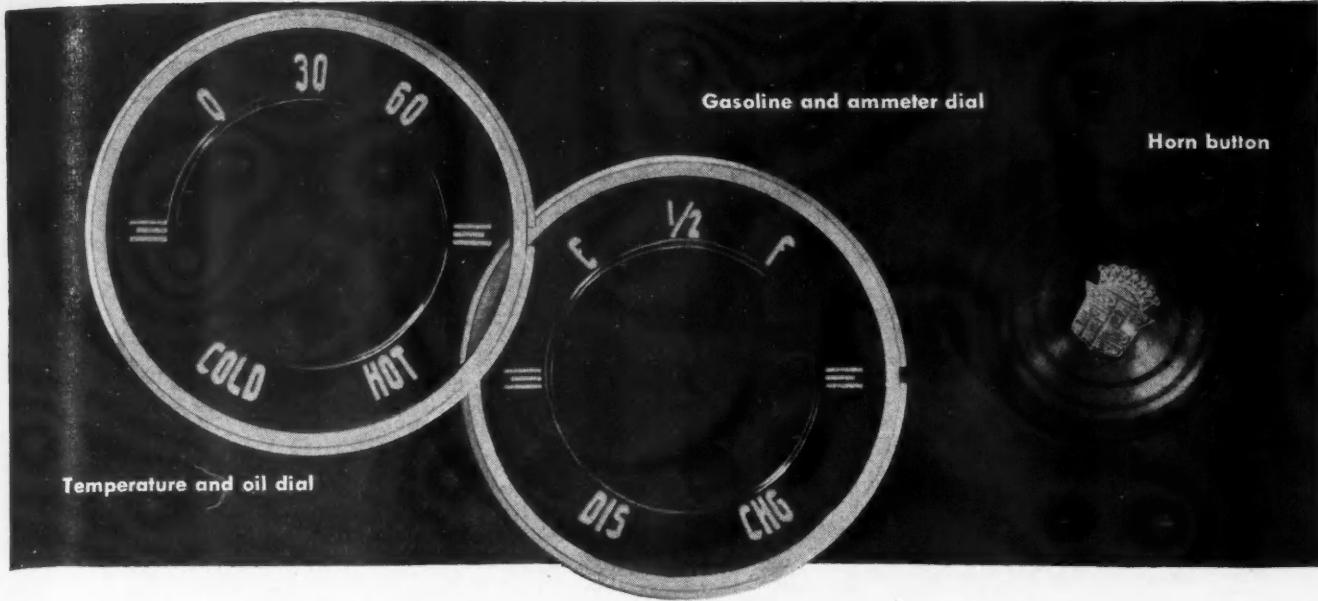
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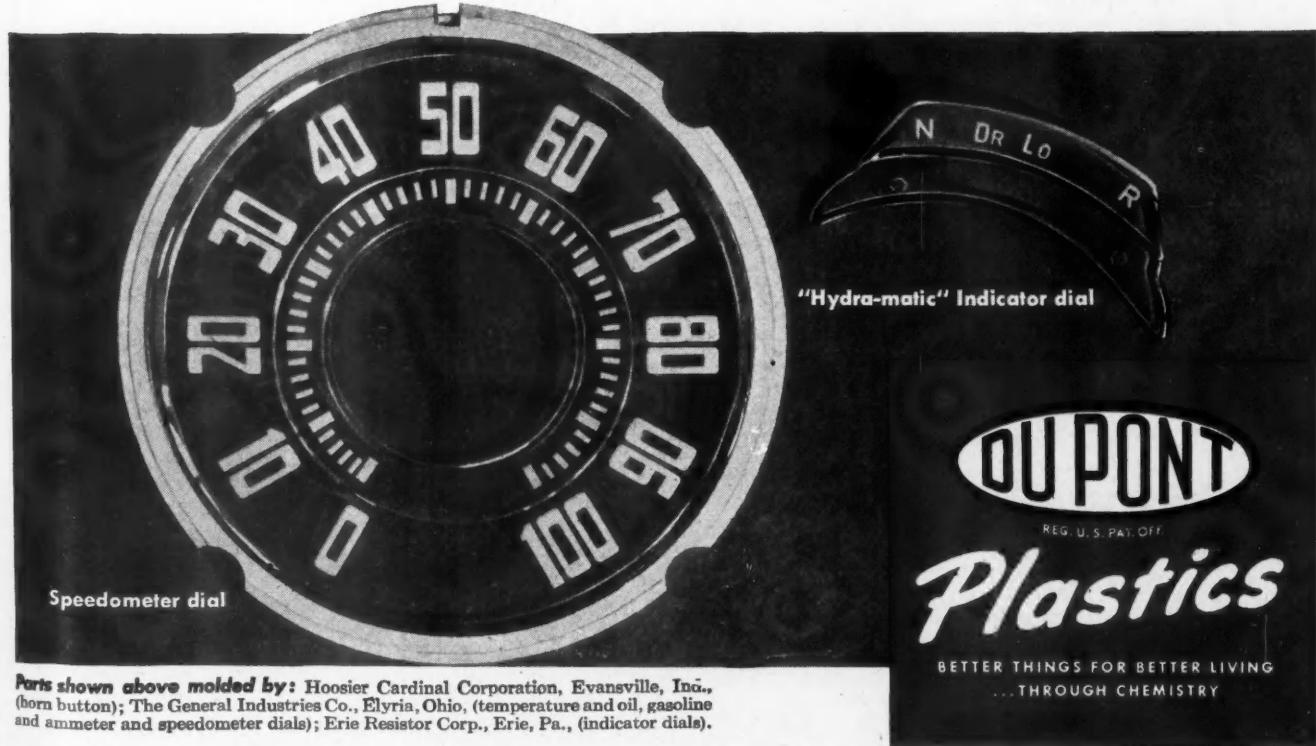
The parts shown here are on one of these new cars. Here is a practical kind of beauty—practical because the optical properties of "Lucite" and its ability to edge-light help provide the driver with instant answers to urgent questions concerning speed, fuel sup-

ply, temperature and other driving essentials.

And in addition, "Lucite" acrylic resin retains its beauty and its clarity for years. For "Lucite" resists moisture, sunlight, and weathering. It has high tensile and flexural strength.

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**Parts shown above molded by:** Hoosier Cardinal Corporation, Evansville, Ind. (horn button); The General Industries Co., Elyria, Ohio, (temperature and oil, gasoline and ammeter and speedometer dials); Erie Resistor Corp., Erie, Pa., (indicator dials).

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BETTER THINGS FOR BETTER LIVING  
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# World's Largest Equipment Market

(Continued from page 26)

for any single make of car can be estimated at between \$10 million and \$20 million. The lower figure would apply to the Big Three—Ford, GM, and Chrysler—because many of the parts and panels are interchangeable among the various lines.

It is reported that in prewar years Chrysler spent approximately \$15 million a year in all of its divisions preparing for new models, including tooling. During the past 18 months, the corporation has spent \$57 million for tools, according to B. F. Hutchinson, chairman of the finance committee, exclusive of tools for 1948 models.

Chrysler's largest expansion program has been in its Dodge Truck Division. About 400,000 sq. ft. of manufacturing space has been added to the Dodge-Mound Road plant. To increase the potential capacity of its passenger car lines, Chrysler also purchased the Graham-Paige plant near its DeSoto-Wyoming plant for \$3 million.

## Independents Have Heavy Commitments

Hudson is known to be well along in development of its 1948 model and has heavy commitments for machinery and other tooling. Furthermore, the company has considerable modernization

work to do in its plants and a reliable source estimates that expenditures of between \$4 and \$5 million will be made for new machinery there during the next year or two.

Willys-Overland has under development a new passenger car model but so far has not indicated just when it will be put into production. It is quite likely that there will be some purchase of machinery and equipment there some time during the next year. Willys currently is completing installation of a battery of large presses in its new press shop which is estimated to cost approximately \$5 million.

Nash Division of Nash-Kelvinator Corporation has spent more than \$12 million in expanding its productive capacity from 80,000 cars annually to more than 250,000, exclusive of tooling for 1948 models. It has yet to equip two new assembly plants at El Segundo, Cal., and Toronto, Ont. Included in the equipment required will be conveyors, ovens, jigs and fixtures, and materials handling equipment.

Packard has already introduced the first of its 1948 models, the convertible, and is expected to follow later this year with at least two more models. The company is reported to have spent \$1.5 million in tooling for the new convertible. It is understood that the com-

pany will continue purchases of machinery and equipment throughout the coming year with an undisclosed part of the \$20 million expansion allocation remaining to be spent.

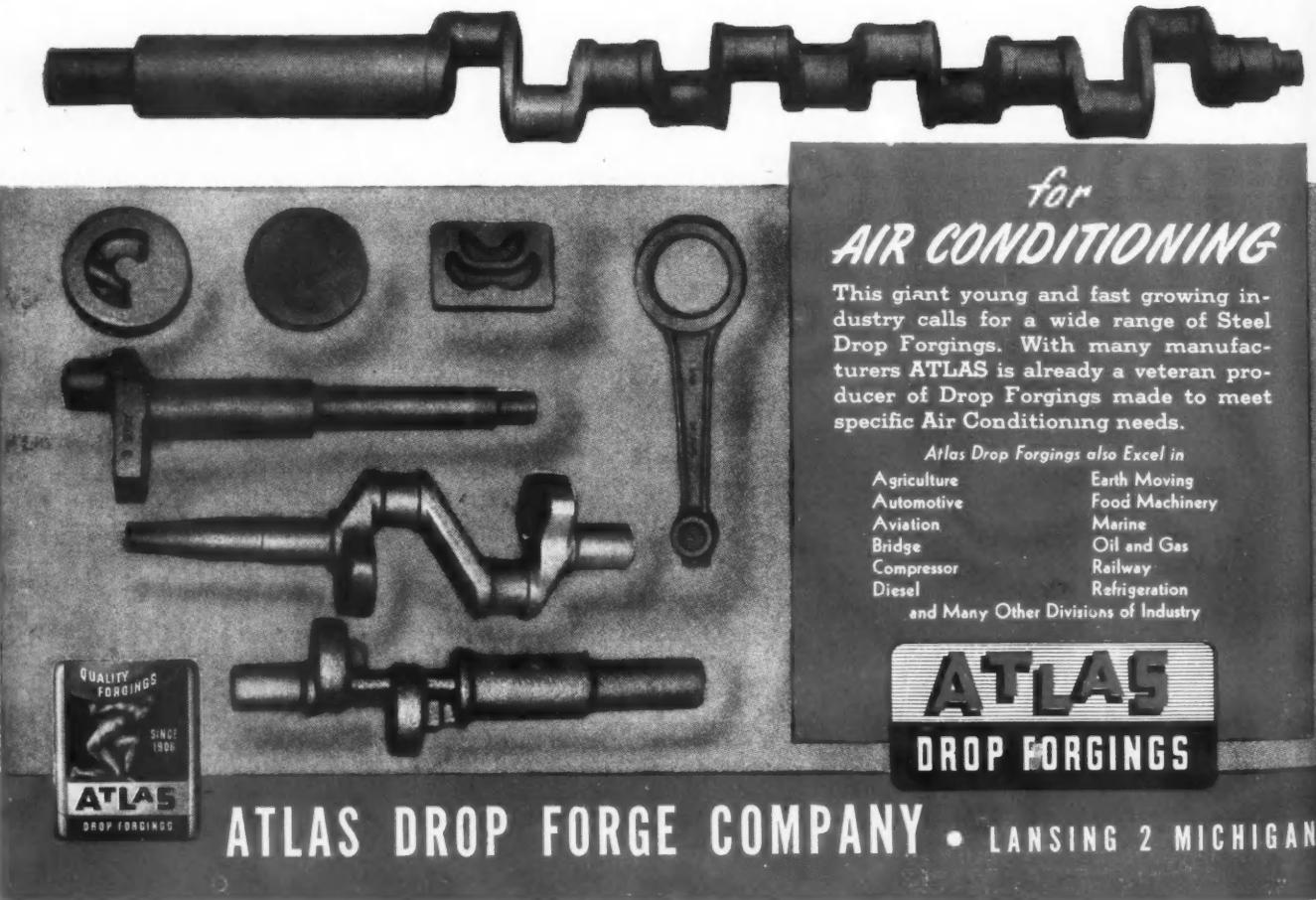
## Automatic Transmissions Require Special Machinery

New developments expected in the next year or two also will require considerable investment in special machinery and tools. If and when more automatic transmissions are adopted, a great deal of special equipment for their manufacture will be required. Types currently in use are extremely complicated and those reported under development also are said to require a great many parts and special shapes.

Packard already has announced that it will have a new automatic transmission in production this year and it is expected that all companies will have some type of automatic gear shifting unit within a couple of years. This development will require large expenditures for special equipment when it comes into general use.

There also is considerable work being done in engine development which likewise will require new machines and equipment. Buick is known to be working with a V-8 engine which, if adopted, would require some radical changes in production equipment. Announcement of the high compression engine by GM also will lead to some changes

(Turn to page 96, please)



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## Trucks by GMC

(Continued from page 88)

door reveal moldings. The same cab is standard equipment on the Series 400 through 470 and offers two additional improvements: a sponge rubber seat pad in place of the rubberized hair pad; and a heavier brown imitation leather covering for the seat and back.

The new grilles are made of heavier stock and, instead of fastening to the sheet metal as is conventional practice, they are mounted rigidly to the frame by means of two sturdy braces. Thus they combine eye-appeal with the function of an additional high bumper.

On Series FC-300 to FC-470, the number two wheelbase has a 72 in. CA dimension recommended for tractor use. All series have hydraulic brakes. Vacuum power operation is standard on Series FC-300 to FC-470, and optional on the FC-280.

## Air Briefs

(Continued from page 36)

## Fast Slow Down

Recent research has indicated that the drag of a supersonic aircraft increases as it slows down from supersonic to sonic speed, then decreases as it slows from sonic to subsonic speed. This means that when the pilot cuts the throttle of a supersonic plane a deceleration takes place that may be as high as 30g (negative). One solution advanced is the use of deceleration rockets similar to JATO units mounted in reverse.

## Helicopter Route

For the first time in history the Civil Aeronautics Board has issued a certificate of public convenience and necessity authorizing the Los Angeles Airways, Inc., to operate a helicopter air route. The new line is an outgrowth of the trial operation by the Army in the Los Angeles area several months ago. The 200-mile route is designed to provide delivery of airmail from outlying post offices to the Los Angeles airport, thereby saving from 4½ to 19½ hr of time. The routes will include 30 post offices. Applications for helicopter routes have been large but the CAB is of the opinion that the present helicopters cannot carry loads much in excess of normal mail poundage and, therefore, has not awarded any passenger routes.

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# General News

(Continued from page 23)

## Test Machine Develops 120,000 lb-in. Torque

Due to a typographical error, torque capacity of the new torsion testing machine installed by Oldsmobile Div., General Motors Corp., was given as 120 lb-in. on page 21 of the July 1 issue of AUTOMOTIVE INDUSTRIES. Obviously this should have been 120,000 lb-in.



The new trend in improved customer service is typified in this photograph of a Navion plane recently acquired by Wesley Cratty (left) and Bill Cratty, sales representatives for Grizzly Mfg. Co.

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## \$4 Million Expansion For SKF Industries

SKF Industries, Inc., intends to spend over \$4 million in a two-year modernization and expansion program which will equip its two Philadelphia plants with new machinery.

## Chevrolet Boosts Truck Prices

General Motors Corp.'s Chevrolet Div. recently raised the prices of its trucks from \$26 on the lightest model to \$162 on the heaviest. Chevrolet has 93 models in its line.

## Hold NSPA 1947 Convention In Chicago December 5-6

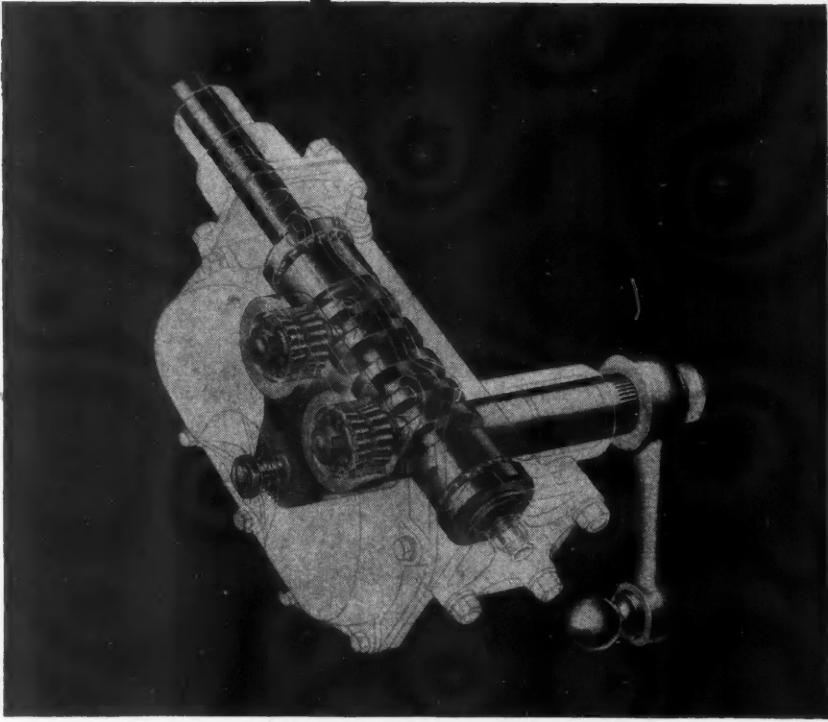
The 1947 Convention of the National Standard Parts Association, to be held prior to the Automotive Service Industries Show, will be held December 5-6 in Chicago. Separate divisional meetings will be held by wholesalers and manufacturers the morning of December 5th; the first general session of the combined membership will be held the afternoon of December 5th, while the general combined sessions of the entire membership will be held December 6.

## Chrysler Shows War Art

Chrysler Corp. recently held a preview of a unique collection of paintings commemorating some of the outstanding heroic engagements of American armed forces. Immediately after World War II, Chrysler Corp. commissioned a group of young artists, who had participated in various engagements, to paint this collection, and each of the views presents the use of war equipment produced by some Chrysler division. This collection has been shown in museums in several sections of the United States, and will be displayed in Detroit during July and August.

(Turn to page 96, please)

# Steering AT ITS BEST



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# General News

(Continued from page 94)

According to K. T. Keller, president, the collection has been requested by other museums, and will be on loan for another two years at least.

## Deere & Co. Buys \$4 Million Plant

Deere & Co. of Moline, Ill., has bought the Des Moines ordnance plant at Ankena, Iowa for \$4 million. It is anticipated that this will be one of the larger Deere plants, ultimately employing between 1500 and 2000 persons.

## Chevrolet Names Thompson, Harrig to Fill Vacancies

I. W. Thompson has been named general parts and accessories manager for Chevrolet Div., General Motors Corp. and E. L. Harrig has been appointed national general service manager. Mr. Thompson had been serving under T. F. Brown who resigned to become a Chevrolet dealer at Burbank, Calif. Mr. Harrig succeeds E. Hedner who has become co-owner and editor of the Chevrolet Dealer News, Inc., in Chicago.

## Gray Marine Buys United Brass & Aluminum

The Gray Marine Motor Co. of Detroit, a Continental Motors Corp. subsidiary, has purchased the United Brass & Aluminum Mfg. Co. of Port Huron, Mich. A manufacturer of water-jacketed manifolds and other intricate marine-engine castings, for many years United Brass & Aluminum has been a primary supplier of Gray Marine.

## New Conveyor Installation To Raise Jeep Production

Installation of a new flight conveyor on its jeep and jeep truck assembly line will permit an increase of 25 per cent in production at Willys Overland Motors, Inc., according to William E. Paris, vice president in charge of operations. The new equipment will be installed and ready to operate by August 3.

## Pontiac Chief Engineer Retires—34 Years with GM

Ben H. Anibal, who directed the engineering developments of the Pontiac car since its inception, retired July 1. He had been with General Motors Corp. 34 years and was chief engineer for 25 years.

## World's Largest

(Continued from page 90)

in engine design and consequent retooling in the not too distant-future.

The trend toward use of transfer or multi-station automatic and semi-automatic machines developed during the war also opens up a new market in the automotive industry. Several companies have installed this type of equipment. Its further extension in the industry appears likely in view of high labor rates and low productive individual efficiency. There also has been a marked trend toward mechanization in materials handling through more general use of conveyors, automatic lift devices and fork trucks and pallets. Ford recently completed a modernization program in its tractor plant with extensive use of mechanized handling equipment.

It is quite apparent that any machinery that will cut unit labor costs will get a good reception. It is estimated that the last general wage increase in the industry increased costs from \$45 to \$65 per car and one way to lower costs would be through machinery which would result in lower unit labor expense.

One deterring factor in new tooling programs about which supplies may well concern themselves is the greatly increased cost compared to prewar levels. It is estimated that it now costs three to four times as much to tool up for a new model as it did before the war. Labor rates in the tool and die industry are up about 50 per cent and another increase is in prospect. In addition, labor productivity is down about 20 per cent. Materials range from 15 to 20 per cent higher and pattern are up at least 150 per cent, making an overall increase of 60 to 80 per cent in the cost of manufacturing a tool or die. Also, tools and dies required for new models often are larger and in many cases more are required to make some body parts, such as fenders and bumpers. Among the factors favorable to the equipment manufacturers is the fact that present high wage rates and union restrictions make it uneconomical to rebuild many old tools.

## Italian Ninfia

(Continued from page 33)

means of the transverse spring in conjunction with supporting arms pivoted at the wheels and the engine frame. Hydraulic shock absorbers are also furnished. Rear suspension consists of two coil springs mounted on a light tubular shaft which supports the brake drums and wheel axles. The shaft is connected to the underbody through two radius rods, and a transverse stabilizer bar is provided to prevent displacement of the body with respect to the shaft. Total weight of the vehicle is 1422 lb. Its maximum speed is said to be about 60 mph and fuel mileage about 33 mpg.

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